

Two Essays on Payout Policy: Strategic Interaction Effects and Union Effects

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**Abstract**

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Previous literature on payout policy has focused on the effects of firm-level characteristics on firms' dividend payouts or stock repurchases. My dissertation investigates whether industry characteristics affect these payout decisions. The first chapter focuses on effects of strategic interaction between firms in product markets on a firm's dividend policy, and the second chapter examines effects of input market rigidity, particularly the strength of labor unions, on corporate payout policy. My empirical results show that these industry characteristics significantly influence firms' payout policy, and their economic impacts are non-trivial. Overall, my dissertation suggests that research in corporate payout policy should incorporate the effects of industry characteristics on firms' optimal payout decisions.

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## **Introduction**

My dissertation explores effects of industry-level characteristics on a firm's payout policy. In particular, I investigate whether the competitive environment in product or input markets affects a firm's payout policy. Product market competition in an industry could affect a firm's payout policy through effects of strategic interaction on a firm's cash flow. A firm's input market environment could also affect a firm's cash flow process through its cost of production. Since a firm's competitive position in product or input markets could affect its cash flow process, one would expect some systematic relationship between competitive environment in product or input markets and payout policy. However, few studies have explored these 'real' determinants of a firm's payout policy. Most previous studies focused on the effects of firm-level financial characteristics, and relatively little attention has been paid to the effects of industry-level characteristics. My dissertation contributes to the literature by investigating how a firm's competitive environment in product or input markets affects its payout policy.

The first chapter of my dissertation, "Strategic interaction in product markets and a firm's dividend policy", investigates whether the degree of competition in product markets affects a firm's dividend policy. In particular, I investigate whether a firm's management of predation risk affects dividend policy. Predation risk refers to the risk of underinvestment and loss of market share to rival firms, when a firm experiences an adverse cash flow shock and external financing is costly. This risk of underinvestment is particularly relevant in a highly concentrated product market because a firm in such an industry could lose sizable profit and market share to rival firms. In order to hedge predation risk, a firm in a concentrated industry should accumulate internal funds to cushion an adverse cash flow shock and mitigate an underinvestment problem. Thus I hypothesize that a firm in a concentrated industry decreases its dividend payouts more than a firm in a competitive industry in response to a rise in cash flow risk, in order to accumulate internal funds and hedge predation risk.

Consistent with this conjecture, using a sample of U.S. manufacturing firms during 1980-2009, I find evidence that a firm in a concentrated industry decreases dividend payouts more than a firm in a competitive industry when their cash flow risk rises. Furthermore, the sensitivity of

dividend payouts to cash flow risk in concentrated markets depends on a firm's leverage. I provide evidence that a firm's high leverage decreases the sensitivity of dividend payouts to cash flow risk in concentrated industries. The result is consistent with theoretical literature of capital structure, such as Brander and Lewis (1986), which identifies benefits and costs of debt policy on product market competition in concentrated industries. A firm's leverage appears to improve a firm's strategic position and reduce its predation risk in product markets.

Overall, these findings suggest that product market competition is an important determinant of dividend policy, and a firm's management of predation risk generates an equilibrium relationship between a firm's cash flow risk, strategic environment, leverage, and payout policy.

The second chapter of my dissertation, "Do labor unions affect a firm's payout policy? : Operating leverage versus rent extraction", examines whether a firm's input market environment, particularly labor market rigidity, affects a firm's payout policy. Recent literature provides evidence that a loss of operational flexibility originated from the presence of labor unions significantly increases a firm's cash flow risk and cost of equity. This paper investigates whether the strong presence of a labor union affects a firm's payout policy. A firm with a strong labor union faces a trade-off between the cost and the benefit of committing to high dividend payouts. On one hand, since a labor union creates greater operating and cash flow risk for a firm, the firm would have a strong incentive to decrease its level of dividend payouts in order to mitigate the risk of dividend omission and/or that of losing a valuable investment opportunity. On the other hand, a firm with a strong labor union would have a high incentive to commit to high dividend payouts, if the firm is highly profitable, in order to protect resources from union capture. Thus the sensitivity of a firm's dividend payouts to the strength of a labor union would depend on the firm's profitability.

Consistent with this conjecture, using the industry-level union coverage data for the sample of U.S. public firms during 1983-2009, I find evidence that, if a firm is moderately profitable, the firm with a strong labor union tends to pay low dividends and makes a relatively high share of its distributions through repurchases. However, if a firm is highly profitable, the firm with a strong labor union strategically commits to high dividend payouts in order to shield resources from

union capture. Overall, these results suggest that labor unions increase both a firm's operating risk and its exposure to rent extraction from unions, and a firm manages these risks by choosing optimal payout policy based on its profitability.

## Chapter 1: Strategic interaction in product markets and a firm's dividend policy

### 1.1 Introduction

Since Lintner (1956), stability of corporate earnings has been recognized as an important determinant of dividend policy. More recently, Brav, Graham, Harvey, and Michaely (2005) conducted interviews of 384 executives and report that 71.9% of CFOs of dividend-paying firms regard stability of future earnings as important or very important for their companies' dividend decisions. Recent articles by Chay and Suh (2009) and Hoberg and Prabhala (2009) have empirically documented that a firm's risk, or cash flow uncertainty, indeed negatively affects its dividend payouts or propensity to pay dividends in U.S. and international markets. Since a firm's competitive environment in product markets affects the cash flow process of a firm in an industry, one would expect a systematic relationship between product market characteristics, a firm's cash flow volatility and its dividend policy. However, few papers have either theoretically or empirically attempted to uncover the relationship between product market competition, a firm's cash flow risk, and its dividend policy.<sup>1</sup>

The objective of this paper is to investigate whether strategic interaction with rival firms in product markets affects a firm's payout policy. In particular, I test whether 'predation risk' in product markets affects a firm's level of dividend payouts. In product markets where output decisions are strategic substitutes (i.e., reaction curves are downward sloping as in Cournot quantity competition), a firm has an incentive to steal rival firms' market shares by expanding its own production capacity and output when rival firms cannot increase their capacities or outputs due to adverse cash flow shocks. The risk of underinvestment or underproduction leading to loss of market share to rival firms, when the firm faces a negative cash flow shock and external financing is costly, is called predation risk.<sup>2</sup> By accumulating sufficient internal funds, the firm

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<sup>1</sup> Exceptions are Booth and Zhou (2009) and Grullon and Michaely (2007), which examine an association between product market competition and dividend policy. Booth and Zhou (2009) find that a firm's market power is positively associated with its dividend payouts while Grullon and Michaely (2007) find the opposite. These two papers use different sample periods and different measures of market competition.

<sup>2</sup> See Bolton and Scharfstein (1990) and Froot, Scharfstein, and Stein (1993) among others.

can mitigate the underinvestment problem when it faces a negative cash flow shock.

Haushalter, Klasa, and Maxwell (2007) find evidence that, all else equal, firms that have high strategic interaction with rival firms in product markets tend to hold high cash reserves. They interpret this positive association as evidence of hedging predation risk in concentrated industries. In different contexts, Grullon and Michaely (2007) examine an association between the degree of market concentration and a firm's dividend payouts, and they reject a view that predation risk affects a firm's payout policy.<sup>3</sup>

Motivated by these studies, my paper investigates whether predation risk in product markets affects a firm's dividend policy. However, I take a novel approach to identify the effect of predation risk on dividend payouts. There are at least two reasons why simply examining the direct association between the degree of market concentration and a firm's dividend payouts may not identify the effect of predation risk on dividend payouts.

First, the degree of product market concentration could proxy for characteristics, such as agency problems, other than strategic interaction. Thus a direct association between the measure of market concentration and dividend payouts may not precisely identify the effect of predation risk. Second, predation risk should not exist if there is no cash flow risk. Theory predicts that predation risk should increase with cash flow risk. Thus the measure of predation risk should be an interaction term between the degree of product market concentration and cash flow risk. The degree of market concentration should affect predation risk only when cash flow risk is substantial.

In my paper, I employ this interaction term between the degree of market concentration and cash flow risk to identify the effect of predation risk on a firm's dividend policy in concentrated industries. While it has been well documented in literature that firms with high cash flow risk

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<sup>3</sup> Grullon and Michaely (2007) argue that large firms, which tend to be financially unconstrained, could pay higher dividends than small firms if large firms face less predation risk in concentrated industries. They find that large firms actually pay lower dividends than small firms in concentrated industries and thus conclude that predation risk does not materially affect a firm's dividend policy. However, one could make a counterargument that large firms have high predation risk since rival firms try to steal sizable market shares from large firms.

generally pay low dividends in order to avoid cutting dividends in the future or to accumulate precautionary savings, this interaction term captures an *extra* sensitivity of a firm's dividend payouts to cash flow risk in concentrated industries. Since predation risk increases with cash flow risk in concentrated industries, a firm in concentrated industries should pay lower dividends than a firm in competitive industries when its cash flow risk is high, in order to increase its internal resources and hedge predation risk. Thus the sensitivity of a firm's dividend payouts to its cash flow risk should be higher in concentrated industries than in competitive industries.

Consistent with this conjecture, using a sample of manufacturing firms with SIC code between 2000 and 3999 during the period 1980-2009, I find evidence that a firm in a concentrated industry decreases dividend payouts more than a firm in a competitive industry when their cash flow risk rises. Furthermore, the sensitivity of dividend payouts to cash flow risk in concentrated markets depends on a firm's leverage. I provide evidence that a firm's leverage reduces the sensitivity of dividend payouts to a change in cash flow risk. The result seems consistent with the theoretical argument of a strategic benefit in Brander and Lewis (1986). Leverage may improve a firm's strategic position and reduce its predation risk in product markets.

To identify firms that have greater strategic interaction with rival firms, following recent literature, I use the Herfindahl-Hirschman Index (HHI) that is published by the U.S. Census to investigate the effect of a firm's predation risk on its dividend policy. The HHI is defined as the sum of squared market shares of all the firms in a given industry and it measures the degree of market concentration in a four-digit SIC industry, or more recently, a six-digit NAICS industry. An industry with a higher HHI value is generally more oligopolistic or highly concentrated. Firms in highly concentrated industries are likely to have greater strategic interaction with rival firms than those in competitive industries and have higher predation risk when their cash flow risk rises. As for a primary measure of a firm's cash flow risk, I use a cross-firm average of a firm's cash flow volatility in the most recent ten years within each four-digit SIC industry as in Opler, Pinkowitz, Stulz, and Williamson (1999) and Bates, Kahle, and Stulz (2009). This industry-level measure is more suitable than a firm-level measure for the purpose of my study, since I investigate whether product market competition within an industry affects a firm's payout policy. Besides, an industry-level measure could be a more precise estimate of cash flow

volatility than a firm-level measure if firms in an industry face similar risks. I also use three alternative measures of industry-level cash flow risk to examine whether my empirical results are sensitive to a particular measure of cash flow risk.

Irrespective of which measure is used to gauge a firm's cash flow uncertainty, I obtain the same qualitative conclusion that the sensitivity of a firm's dividend payouts to cash flow risk is higher when a firm has greater strategic interaction with rival firms. I also find a negative relationship between a firm's risk-dividend sensitivity and its leverage for all measures of cash flow uncertainty. These results are robust even after controlling for firm size, profitability, investment and growth opportunities, and retained earnings divided by total assets (RE/TA). I also obtain a similar set of results when I take a potential endogeneity problem between dividend and leverage decisions into account.

This relationship between dividend payouts, cash flow risk, and leverage is not only statistically significant but also economically important. For a firm with the 25<sup>th</sup> percentile value of leverage, a one standard deviation increase in a firm's cash flow uncertainty reduces dividend payouts (divided by earnings) by 22.4 percent in competitive industries but by 65.6 percent in concentrated industries when other financial characteristics of the firm are held constant at sample median values. However, while the sensitivity of a firm's dividend payouts to cash flow risk in competitive industries changes little with leverage, the sensitivity varies significantly with a firm's debt position in concentrated industries. For a firm with the median value of leverage, a one standard deviation increase of a firm's cash flow risk reduces dividend payouts by 51.0 percent in concentrated industries after controlling for other firm characteristics. However, a firm with the 75<sup>th</sup> percentile value of leverage decreases dividend payouts only by 34.3 percent in response to a one standard deviation increase in cash flow uncertainty. These results are consistent with substitution between the strategic benefits of debt policy and payout policy on product market competition in concentrated industries. A firm's leverage improves its strategic position and reduces its predation risk in product markets. Thus the sensitivity of dividend payouts to a change in cash flow risk decreases with a firm's leverage.

While empirical evidence is supportive for the hypothesis that a firm which is exposed to

predation risk tends to decrease its dividend payouts more than a firm in a competitive market when a firm's cash flow risk rises, I also investigate whether an increase in a firm's cash flow uncertainty has actually affected its accumulation of internal funds, especially cash holdings, more strongly in product markets where strategic interaction among firms is high. Bates et al (2009) finds that "disappearing dividends" documented in Fama and French (2001) are associated with increased cash holdings of firms. One would expect that, when the firm's cash flow uncertainty increases, a firm exposed to predation risk has a stronger incentive to increase cash balances and decrease dividend payouts to hedge predation risk than a firm in a competitive market. Thus, one would expect that the association between a firm's cash holdings and its cash flow uncertainty is stronger in concentrated markets than in competitive markets. The empirical results indeed confirm that the positive association is stronger in concentrated markets. Moreover, I find a negative relationship between the sensitivity of a firm's cash holdings to its cash flow risk and leverage, which is analogous to the negative relationship between a firm's risk-dividend sensitivity and its leverage. These results are consistent with the conjecture that a firm's cash flow uncertainty decreases its dividend payouts more in concentrated markets than competitive markets since a firm in a concentrated market accumulates more internal funds in order to reduce its predation risk.

This paper contributes to the literature in two ways. First, it increases the understanding of how a firm's cash flow risk affects its dividend policy differently between competitive and concentrated markets. A few recent studies have examined the relationship between product market competition and dividend policy. Grullon and Michaely (2007) primarily investigate an association between product market competition and dividend payouts in the context of corporate governance. They find that a firm's market power is negatively associated with its dividend payouts and argue that this negative relationship may be attributed to the weaker disciplinary forces of competition on self-interested managers in more concentrated industries. In contrast, Booth and Zhou (2009) find a positive relationship between a firm's market power and its dividend payouts and argue that a firm's market power in product market competition might reduce its cash flow risk and increase its dividend payouts. My focus is different from others in that I investigate the effect of a firm's corporate risk management of rival firms' predatory actions on the sensitivity of a firm's dividend payouts to cash flow risk when the firm has high

strategic interaction in product markets. Although dividend payouts are known to be very sticky over time, I provide cross-sectional evidence that firms in concentrated markets do actually adjust their dividend payouts in order to manage their risk of losing market shares to their rivals, and its economic impact is shown to be non-trivial.

Second, that leverage affects the sensitivity of dividend payouts to cash flow risk is a new finding, and it is consistent with the theory of strategic debt in the capital structure literature. The sensitivity of a firm's dividend payouts to cash flow risk appears to be decreasing with its leverage, as its leverage could improve a firm's competitive position in concentrated industries through the strategic benefit of debt to reduce its predation risk. By documenting the association between leverage and dividend payouts through the lens of predation risk, I shed new light on the relationship between capital structure and payout decisions. This is increasingly important to ultimately understand the joint optimization problem of two major corporate finance decisions.<sup>4</sup>

Overall, these results indicate that managing predation risk is an important determinant of dividend policy. The organization of this paper is as follows. The next section constructs the predation risk hypothesis. Section 1.3 presents proxy variables and descriptive statistics. Section 1.4 conducts an empirical analysis and presents the results. Section 1.5 concludes the paper.

## 1.2 Hypothesis Construction

In oligopolistic market structures where production decisions are strategic substitutes (i.e., downward-sloping reaction curves as in Cournot quantity competition), an individual firm would have an incentive to steal rival firms' market shares by expanding its own production capacity and output, when rival firms cannot increase their capacities or outputs due to adverse cash flow shocks. The risk of underinvestment or underproduction, leading to a loss of market share to rival firms, when the firm faces a negative cash flow shock and has limited access to outside capital, is called "predation risk". In general, there is greater incentive for a firm in a non-

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<sup>4</sup> Fama and French (2002) is a recent empirical paper trying to unify financing and payouts decisions in a joint framework.

competitive, or concentrated, product market to increase its market power by stealing the market share of rival firms and capturing associated rents than for a firm in a competitive market. Since strategic interaction among firms in concentrated industries should be higher than that in competitive industries, predation risk should be also higher for a firm in a concentrated market than in a competitive market.

Bolton and Scharfstein (1990) and Froot et al (1993) among others suggest that a firm which is exposed to predation risk in a concentrated industry has an incentive to accumulate internal funds in order to discourage predatory behavior of its rival firms when access to external financing sources is limited. One way to accumulate internal funds is to reduce dividend payouts. However, a firm in a concentrated industry does not necessarily have to hedge predation risk if its cash flow risk is low, since predation risk matters only when cash flow risk is high. When a firm's cash flow risk is high, its probability of underinvestment and losing market share to rival firms is also high. While prior literature on payout policy has documented that firms with high cash flow risk in competitive or concentrated industries tend to pay low dividends in order to avoid cutting dividends in the future or to accumulate precautionary savings, a firm in a concentrated industry has an *extra* incentive to reduce dividend payouts when its cash flow risk is high, in order to accumulate internal funds and hedge predation risk. Thus I conjecture the first part of the predation risk hypothesis that the sensitivity of a firm's dividend payouts to cash flow risk should be higher when the firm has greater strategic interaction with rival firms in product markets (i.e., in concentrated industries).

However, there is reason to suspect that the above relationship between cash flow risk and dividend payouts may be also affected by a firm's leverage. On one hand, literature in capital structure suggests strategic benefits of a firm's debt policy for its competitive position relative to its rivals in product markets.<sup>5</sup> Debt can be a credible commitment to expand a firm's production capacity and/or outputs. In a product market where firms compete in quantity as in Cournot oligopoly, a firm with debt might have less incentive to lower dividends and accumulate internal

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<sup>5</sup> See Brander and Lewis (1986), among others, for strategic benefit of debt policy under limited liability.

funds to hedge predation risk than a firm with no debt, since a firm's debt implies a commitment to expand output: rival firms would be discouraged to prey on a firm which is committed to be aggressive in the product market through its leverage. Thus, a firm with leverage faces lower predation risk than a firm with no leverage due to the strategic effect of debt: predation risk is lessened by the strategic benefit of debt. A recent article by Lyandres (2006) finds evidence of a strategic benefit of debt when interaction between firms in product markets is high. Since debt reduces a firm's predation risk, I conjecture the second part of the predation risk hypothesis that the sensitivity of a firm's dividend payouts to cash flow risk should decrease with leverage in concentrated industries.

On the other hand, literature on predation risk also suggests a negative effect of high indebtedness on a firm's predation risk. A firm with high leverage is likely to find it difficult to raise external funds to finance new investments due to financial distress or saturated debt capacity.<sup>6</sup> This will be especially true for a firm with high leverage when its industry faces an economic downturn. A firm with moderate leverage, however, may still obtain outside financing despite the economic downturn in order to expand its production capacity and drive competitors out of business. Thus one might conjecture that a firm with high leverage would be more financially constrained so that it tends to attract more predatory actions from rival firms in product markets. Combined with the second part of the hypothesis, this story would imply that predation risk is initially decreasing with leverage if a firm's leverage is moderate but ultimately increasing with leverage if it has high indebtedness. Campello (2006) essentially combines elements of these two stories into one unified model, and he finds evidence that a moderate level of debt relative to rivals is beneficial for sales growth while high leverage leads to underperformance in product markets. Thus I conjecture the third part of the predation risk hypothesis that the sensitivity of a firm's dividend payouts to cash flow risk increases with leverage, when leverage is high, due to the financial distress cost of indebtedness which increases predation risk.

The next hypothesis summarizes the relationship between a firm's cash flow risk, dividend payouts, leverage, and product market competition.

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<sup>6</sup> See Chevalier (1995) and Kovenock and Phillips (1997) for evidence of costs of high indebtedness for product market competition.

*Predation risk hypothesis:*

The hypothesis consists of three parts:

- (i) The sensitivity of a firm's dividend payouts to cash flow risk is higher when the firm has greater strategic interaction with rival firms in product markets (i.e., in concentrated industries).
- (ii) The sensitivity of a firm's dividend payouts to cash flow risk decreases with the firm's leverage when leverage is moderate in concentrated industries.
- (iii) The sensitivity of a firm's dividend payouts to cash flow risk increases with the firm's leverage when leverage is high in concentrated industries.

The second and the third parts of the hypothesis are based on an implicit assumption that leverage is an exogenous variable to a firm's dividend decision. A more realistic formulation of leverage as a firm's choice variable would generate additional testable hypotheses on a firm's dividend policy. While interesting, that is not within the scope of this paper and is left for future research.

### 1.3 Data

#### 1.3.1 Sample Selection

I use the CRSP/Compustat Merged Database (Industrial Annual) as the base sample for the period 1980-2009. My procedure for sample screening and variables construction closely follows Fama and French (2001) with some minor modifications. The CRSP historical SIC codes are used to identify the four-digit SIC code for each firm-year observation. Due to the data availability of industry-level measures of market power from the Census of Manufacturers, the sample is limited to firms operating in manufacturing industries (SIC 2000-3999) during the period 1980-2009. The final sample is an unbalanced panel comprising 59,463 firm-year

observations from 5,965 firms.

### 1.3.2 Variable Definitions

#### 1.3.2.1 The measure for intensity of product market competition

To identify firms or industries that are likely to have greater strategic interaction with rival firms, I use the Herfindahl-Hirschman Index (HHI) constructed and published by the U.S. Census Bureau. It measures the degree of concentration in each industry. An industry with a higher HHI is generally regarded to be more concentrated or less competitive, indicating that firms in an industry with a high HHI value have greater market power and more strategic interaction than firms in an industry with a low HHI value. Thus, firms in highly concentrated markets face greater predation risk than those in less concentrated markets. The HHI is defined as the sum of the squared market shares of all the firms in a given industry. The U.S. Census publishes HHI for manufacturing industries every five years. The HHI data used in this research are collected from the 1982, 1987, 1992, 1997, 2002 and 2007 Census of Manufacturers. The U.S. Census had calculated HHI by four-digit SIC industry until the 1992 Census. Since the 1997 Census, it has computed HHI by six-digit NAICS industry. Correspondence tables between NAICS codes and 1987 SIC codes are available at the U.S. Census website though they are not always one-to-one matching. My conversion procedure from HHI in 1997, 2002, 2007 NAICS codes to HHI in 1987 SIC code closely follows Ali et al (2009).<sup>7</sup> Ali et al (2009) among others suggest that the Census-based HHI is more accurate than the Compustat-based HHI since it is based on information from both private and public firms in a four-digit SIC industry. A limitation of using the Census-based HHI is the lack of time series variations, since it is only updated every five years (i.e., 1982, 1987, 1992, 1997, 2002 and 2007 in my study). As a consequence, following Ali et al (2009), I assign the same HHI value to each industry for five years, including the current year, the previous two years and the next two years (e.g., 1982 HHI value is assigned to 1980, 1981, 1982, 1983, and 1984).

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<sup>7</sup> Subsequent empirical analysis using the sample between 1995 and 2009 by NAICS industry classification, though not reported, yield qualitatively similar results.

### 1.3.2.2 Measures for cash flow uncertainty

In this paper, as a primary measure of a firm's cash flow risk, I use an industry-level measure of cash flow uncertainty, CFVOL, defined as the equally-weighted cross-firm average of cash flow volatility of firms in each four-digit SIC industry as in Opler et al (1999) and Bates et al (2009).<sup>8</sup> A firm's cash flow is defined as earnings after interest and taxes but before depreciation divided by total assets. A firm's CFVOL is then calculated as the equally-weighted average of each firm's standard deviation of cash flow in the most recent ten years within the firm's four-digit SIC industry. For instance, when I calculate CFVOL of a firm  $i$  in an industry  $j$  in 2009, I compute a standard deviation of a firm  $i$ 's cash flow between 2000-2009 and then take an equally-weighted average of this standard deviation of cash flow across all firms in an industry  $j$ .

I also use three alternative measures of industry-level cash flow risk to examine whether my empirical results are sensitive to a particular measure of cash flow risk. A firm's VCFVOL is defined as the (sales) value-weighted average of cash flow volatility of firms in the most recent 10 years in each 4-digit SIC industry, and MCFVOL is defined as the median of cash flow volatility of firms in the most recent 10 years in each 4-digit SIC industry. Finally, a firm's ROAVOL is defined as the equally-weighted average of each firm's standard deviation of ROA in the most recent ten years within the firm's four-digit SIC industry. ROA is a firm's operating income before depreciation divided by total assets. This last measure excludes the effect of interest and taxes on a firm's cash flow risk.

Figure 1 plots the 'Mean CFVOL (HHI<0.1)', the mean value of CFVOL of the group of firms in competitive industries in each year, and the 'Mean CFVOL (HHI>0.1)', the mean value of CFVOL of the group of firms in concentrated industries in each year, during 1980-2009 using

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<sup>8</sup> Recent literature on the effect of a firm's risk on its dividend policy measures a firm's business or cash flow risk by stock return volatility. Hoberg and Prabhala (2009) find that a firm's daily stock return volatility in a current year is an important determinant of a firm's propensity to pay dividends. Chay and Suh (2008) use a firm's most recent two years of monthly stock return volatility as a measure of its cash flow uncertainty. A concern of using stock return volatility in my analysis is that stock return volatility could reflect not only cash flow uncertainty but also uncertainty in discount rate.

the full sample of 59,463 firm-year observations described in Table 1. The group of firms in competitive industries (i.e., the low strategic interaction group) consists of firms whose HHI value is less than 0.1, and the group of firms in concentrated industries (i.e., the high strategic interaction group) consists of firms whose HHI value is greater than 0.1. The U.S. Department of Justice and Federal Trade Commission classifies industries whose HHI value is lower than 1000 as competitive industries and those with a HHI value higher than 1000 (1800) as modestly (highly) concentrated industries. Our HHI measures are equal to original HHI values divided by 10,000.

Figure 1 shows that mean values of a firm's cash flow risk in both competitive and concentrated industries have substantially increased since 1995. These statistics seem to suggest that increasing cash flow uncertainty is an economy-wide phenomenon. There are time-variations in cash flow risk in both competitive and concentrated industries over time. Besides, these two lines are located very close to each other during the sample period. These results cast some doubt on a conventional view that a firm's high market power reduces its cash flow volatility. At least in this sample, the degree of strategic interaction in product markets does not seem to significantly vary with a firm's cash flow risk. This property would enable my use of an interaction term between cash flow risk and strategic interaction as a main variable of interest and my computation of marginal effects of a change in a firm's cash flow risk on its dividend payouts in competitive and concentrated industries.<sup>9</sup>

### 1.3.2.3 Measures for corporate payouts and other firm characteristics

As a primary measure of a firm's dividend payouts, I use Div/E, the dividend-earnings ratio. I define Div/E as the common dividends divided by operating income before depreciation. Div/E is set to be missing when the denominator is negative. When the denominator is zero, Div/E is also treated as a missing value if the numerator is positive. When both the denominator and the numerator are zero, Div/E is set to be zero. As alternative measures of dividend payouts, I also

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<sup>9</sup> If the degree of strategic interaction in product markets, or HHI, significantly affects a firm's cash flow risk, one cannot calculate a partial derivative of a firm's dividend payouts with respect to its cash flow risk, conditional on HHI.

use  $\text{Div}/\text{TA}$ , the common dividends divided by total assets, and  $\text{Div}/\text{ME}$ , the common dividends divided by market equity. Total corporate payouts are defined as the sum of dividend payouts and net share repurchases. Then total corporate payouts are divided by operating income before depreciation ( $\text{Total}/\text{E}$ ), by total assets ( $\text{Total}/\text{TA}$ ), and by market equity ( $\text{Total}/\text{ME}$ ), respectively.

In order to examine the association between dividend payouts, cash flow risk and product market competition, I include the following variables in regressions of dividend payouts to control for other determinants of a firm's dividend policy. Fama and French (2001) identify firm size, profitability, and growth opportunities as important determinants of a firm's propensity to pay a dividend. DeAngelo et al (2006) show the ratio of retained earnings over total assets ( $\text{RE}/\text{TA}$ ) is an important determinant of the propensity to pay a dividend as a measure of a firm's life cycle stage. Fama and French (2002) document that pecking order and trade-off models of capital structure predict a negative association between leverage and dividend payouts (divided by total assets). In the trade-off model, high financial distress costs caused by high leverage would decrease their future expected profits and dividend payout. In the pecking order model, firms would pay fewer dividends as they are more leveraged, since they would accumulate internal funds by cutting dividends and pay down risky debt. Both models would predict that higher leverage is associated with lower dividend payouts.<sup>10</sup>

Table 1 shows summary statistics of the measure of strategic interaction, four measures of cash flow uncertainty, and firm-level characteristics for regression analysis of corporate payouts. Firm characteristics include additional control variables used in regression analysis of cash holdings, motivated by Opler et al (1999) and Bates et al (2009), discussed later. All variables except HHI are winsorized at the 1 and 99 percentiles to avoid the impact of extreme values.

## 1.4 Empirical Analysis

### 1.4.1 Univariate analysis

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<sup>10</sup> Detailed definitions of corporate payouts and firm characteristic are listed in the Appendix A.

Table 2 reports coefficients of correlation between a firm's cash flow uncertainty and its corporate payouts for the full sample of firm-year observations described in Table 1. Firms are sorted into either the group of low strategic interaction firms (i.e., competitive industries) or high strategic interaction firms (i.e., concentrated industries). The HHI, Herfindahl-Hirschman Index, is the proxy for intensity of strategic interaction, and the low (high) strategic interaction group consists of firms whose HHI value is less (greater) than 0.1. Panel (a) reports correlation coefficients between four measures of cash flow risk and dividend payouts in competitive and concentrated industries. Panel (b) reports correlation coefficients between four cash flow risk measures and total payouts (i.e., dividends plus net share repurchases).

As expected, these correlation coefficients are all negative, and the group of high strategic interaction firms (i.e., concentrated industries) has higher correlation coefficients in absolute terms than that of low strategic interaction firms (i.e., competitive industries) for all measures of cash flow risk in both panels. These results are consistent with the first part of the predation risk hypothesis that the sensitivity of dividend payouts to cash flow risk is higher in concentrated industries than competitive industries since firms in concentrated industries have more incentive to set lower dividend payouts and accumulate internal funds to fend off predatory behavior from rival firms than those in competitive industries.

As univariate results appear supportive for the first part of the predation risk hypothesis, I now turn to a more formal test of all parts of the hypothesis by conditioning on other important variables which are known to affect a firm's payout policy.

## 1.4.2 Multivariate analysis

### 1.4.2.1 Empirical specification

The main objective of this section is to investigate whether the sensitivity of a firm's dividend payouts to its cash flow risk is higher when it has greater strategic interaction with rival firms in product markets. I test the predation risk hypothesis by estimating the baseline model as follows:

$$\begin{aligned}
\text{Dividends} = & \beta_1 * \text{HHI} + \beta_2 * \text{cash flow risk} \\
& + \lambda_1 * \text{cash flow risk} * \text{HHI} \\
& + \lambda_2 * \text{cash flow risk} * \text{HHI} * \text{Leverage} \\
& + \lambda_3 * \text{cash flow risk} * \text{HHI} * (\text{Leverage})^2 \\
& + \gamma * \text{control variables (including Leverage, (Leverage)}^2)
\end{aligned} \tag{1}$$

The sign of  $\beta_2$  is predicted to be negative as managers might pay low dividends to avoid cutting dividends in the future when cash flow risk is high. It may also be the case that firms with high cash flow risk accumulate precautionary savings. Consistent with these ideas, Chay and Suh (2009) and Hoberg and Prabhara (2008) among others find significantly negative effects of cash flow risk on dividend payouts or the probability of paying dividends. The sign of  $\beta_1$  would be predicted to be negative if we interpret HHI as a direct measure of predation risk as in Haushalter et al (2007). However, the sign of  $\beta_1$  is ambiguous under other interpretations since the degree of product market competition could also affect agency conflicts between managers and shareholders or corporate governance (Grullon and Michaely (2007), Giroud and Mueller (2010)). Booth and Zhou (2009) also argue that the degree of product market competition may affect a firm's ability to reduce its cash flow risk. Thus the degree of product market competition, HHI, may contain information other than a firm's predation risk.

In order to identify the effect of predation risk on a firm's dividend policy, I use three interaction terms between cash flow risk and the degree of product market competition. The idea is that predation risk in concentrated industries should matter only when a firm's cash flow risk is high. While the degree of product market competition should affect the sensitivity of dividend payouts to cash flow risk through management of predation risk, it is not clear why agency conflicts or a firm's ability to reduce its cash flow risk should affect risk-dividend sensitivity. Thus the three interaction terms would enable me to better assess the effect of strategic interaction, or predation risk, on risk-dividend sensitivity.

The predation risk hypothesis discussed in the previous section predicts signs of the three

interaction terms;  $\lambda_1$ ,  $\lambda_2$  and  $\lambda_3$ . The third term on the right hand side of equation (1) is an interaction term between the degree of product market competition and cash flow risk, and the coefficient  $\lambda_1$  captures the extra sensitivity of dividend payouts to cash flow risk in addition to  $\beta_2$  in the presence of strategic interaction in product markets. The first part of the predation risk hypothesis predicts that the sign of  $\lambda_1$  is negative, since a firm with high cash flow risk would pay lower dividends to accumulate internal funds when the firm has higher strategic interaction with rival firms.

The second part of the hypothesis predicts a sign of  $\lambda_2$ , and the hypothesis predicts a positive sign of  $\lambda_2$ . As discussed in the section of hypothesis construction, a firm's debt policy could mitigate the effect of predation risk on dividend payouts. Since the firm's leverage may act as a commitment to expand outputs and capacities and thus as a strategic advantage in product markets (e.g., Brander and Lewis (1986)), the firm with leverage might be less exposed to the risk of predatory behavior from rival firms. In other words, a firm's leverage could reduce its predation risk and sensitivity of its dividend payouts to cash flow risk. The fourth term on the right hand side of equation (1), which is an interaction term between the degree of product market competition, cash flow risk and leverage, should capture this effect and the sign of  $\lambda_2$  is predicted to be positive.

As for the sign of  $\lambda_3$ , which is the coefficient of an interaction term between the degree of product market competition, cash flow risk and the square of leverage, the third part of the hypothesis predicts the sign is negative. This term captures a non-linear relation between a firm's leverage and its exposure to predation risk. While a firm's leverage may improve its competitive position in product markets, a high level of debt might make the firm's financial position weak and its competitive position vulnerable to predatory behavior of rival firms in the industry. In other words, a firm's high leverage might increase its predation risk and risk-dividend sensitivity. This implies that the sign of  $\lambda_3$  is negative under the third part of the predation risk hypothesis.

In summary, predicted signs of the three interaction terms under the predation risk hypothesis are given as follows:

- $\lambda_1 < 0$
- $\lambda_2 > 0$
- $\lambda_3 < 0$

#### 1.4.2.2 Tobit regressions on dividend payouts

I estimate the baseline model (1) with Div/E as the dependent variable in Table 3. In all specifications, I run Tobit regressions to account for the truncation of the empirical distribution of dividends payouts at zero. Clustered standard errors are used to account for within-firm correlations of error terms. Year dummies and industry fixed effects for 2-digit SIC industries are included in all specifications. I use CFVOL, the equally-weighted average of each firm's standard deviation of cash flow in the most recent ten years within each four-digit SIC industry, as a proxy for cash flow risk in all models in Table 3.

Model (a) estimates the baseline model without the interaction terms. Model (b) includes only the first interaction term while model (c) includes the first and second interaction terms. Model (d) includes the three interaction terms. All models include control variables known to affect a firm's dividend policy. In addition to leverage and the square of leverage terms, control variables include a firm's asset growth, size, profitability, market-to-book ratio, and retained earnings divided by total assets.

My interests are in the signs of the three interaction terms. In model (b), the sign of CFVOL\*HHI is negative and significant at the 5% level, supporting the first part of the predation risk hypothesis. Model (c) includes the two interaction terms to jointly test the first and the second parts of the hypothesis. The signs of CFVOL\*HHI and CFVOL\*HHI\*Lev are negative and positive respectively, consistent with both parts of the predation risk hypothesis. These

interaction terms are significant at the 1% in model (c).

Finally, model (d) includes the three interaction terms to test all three parts of the predation risk hypothesis. The estimated signs of  $CFVOL*HHI$ ,  $CFVOL*HHI*Lev$ , and  $CFVOL*HHI*(Lev)^2$  are negative, positive, and negative respectively, consistent with the predation risk hypothesis. However, while the first interaction term is still highly significant, the second and the third interaction terms are not significant. This result is not unexpected: the last two interaction terms are highly correlated with each other so that it is difficult to precisely estimate coefficients of the last two interaction terms.<sup>11</sup> Overall, while there is little support for the third part of the hypothesis, the estimation results in models (b) and (c) in Table 3 are consistent with the first and second parts of the hypothesis, providing support for the predation risk hypothesis.

While the results in Table 3 are broadly consistent with the predation risk hypothesis, one could argue that the positive sign of the second interaction term,  $CFVOL*HHI*Lev$ , may be open to an alternative explanation other than the strategic benefit of debt in concentrated industries. For instance, firms with no debt may not have access to external funds while firms with debt may be financially unconstrained. In that case, the positive sign of the second interaction term might simply indicate that firms with debt are financially unconstrained and have higher capacity of paying dividends than firms with no debt. A level of debt may simply proxy for a degree of a firm's access to external funds.

In order to rule out this alternative explanation, I estimate the baseline model for the sample of large firms in models (a) and (b). I restrict the sample in these models to firms that are in the top 25<sup>th</sup> percentile of an empirical distribution of book assets. Previous literature has suggested that large firms tend to be financially unconstrained and have access to external funds. Thus a large firm with no debt and another with debt should both be financially unconstrained. If the alternative explanation were correct, we should not observe a significantly positive coefficient of  $CFVOL*HHI*Lev$  for the sample of large firms, since large firms are, by construction,

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<sup>11</sup> Including additional pair-wise interaction terms such as  $HHI*Lev$ ,  $HHI*(Lev)^2$ ,  $CFVOL*Lev$ , and  $CFVOL*(Lev)^2$  in models (c) and (d) decreases statistical significance further but does not qualitatively affect the estimation results in these models.

financially unconstrained regardless of their levels of debt.

The estimation result in model (a) provides evidence against the alternative explanation. The coefficient of the second interaction term remains significantly positive at the 1% level, suggesting that debt has a positive effect on dividend payouts even for a sample of large firms that are financially unconstrained. The coefficient is also positive in model (b) though it is significant only at the 10% level. Thus it is unlikely that the positive coefficient of debt represents a degree of a firm's access to external funds, since large firms are financially unconstrained regardless of their debt levels. It seems plausible to interpret the positive coefficient as evidence consistent with a strategic benefit of debt in concentrated industries.

Another concern of my interpretation of the second interaction term is that a firm's gross leverage may not be an appropriate measure of a strategic benefit of debt. Since the strategic benefit of debt in Brander and Lewis (1986) originates from a limited liability effect, a firm's high cash holdings would reduce the benefit of debt for shareholders, if cash belongs to debtholders in a case of default. Thus an appropriate measure of debt should be net leverage, which is gross leverage minus cash holdings. I computed net leverage, NLev, and replaced leverage with NLev to estimate equation (1).

Models (c) and (d) in Table 4 report regression results on equation (1), using net leverage. The coefficients of CFVOL\*HHI are negative and still significant at the 1% level, supporting the first part of the predation risk hypothesis. The signs of the second interaction term are positive and significant at the 5% level in both models, consistent with the second part of the hypothesis. The result in model (c) is similar to that with gross leverage in model (c) in Table 3.<sup>12</sup> Overall, while I find no support for the third part of the predation risk hypothesis in model (d), the first and second parts of the hypothesis are robust to an alternative measure of leverage.

Next, I examine economic significance of the first two interaction terms. I show that they are

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<sup>12</sup> However, note that a firm's net leverage and dividend payouts are functions of cash holdings so that net leverage and dividend payouts are likely to be highly endogenous. Thus one should exercise some caution interpreting this result.

not only statistically significant but also economically important. I examine the impact of a change in cash flow risk on a firm with the median HHI value in competitive industries (HHI=0.035) and on a firm with the median HHI value in concentrated industries (HHI=0.155). With estimated coefficients in model (c) in Table 3, a one standard deviation increase of a firm's cash flow uncertainty reduces dividend payouts (divided by earnings before depreciation) by 22.4 percent in competitive industries but by 65.6 percent in concentrated industries for a firm with the 25<sup>th</sup> percentile value of leverage, when other financial characteristics of the firm are held constant at sample median values.<sup>13</sup> This finding supports the first part of the predation risk hypothesis that the sensitivity of a firm's dividend payouts to cash flow risk is higher when the firm has greater strategic interaction with rival firms in product markets.

However, while the sensitivity of a firm's dividend payouts to cash flow risk in competitive industries changes little with leverage, the sensitivity varies significantly with a firm's debt position in concentrated industries. For a firm with the median level of leverage, a one standard deviation increase of a firm's cash flow risk reduces dividend payouts by 51.0 percent in concentrated industries after controlling for other firm characteristics, and the same size change in cash flow risk decreases dividend payouts only by 34.3 percent for a firm with the 75<sup>th</sup> percentile value of leverage. These results are consistent with the second part of the predation risk hypothesis that the sensitivity of a firm's dividend payouts to cash flow risk should decrease with the firm's leverage due to strategic benefits of debt which reduces predation risk in concentrated industries.

Figure 2 plots the sensitivity of a firm's dividend payouts to cash flow risk, conditional on a firm's leverage, in competitive and concentrated industries, using estimated coefficients in model (c) in Table 3. The sensitivity measures percentage change in a firm's dividend payouts in response to one standard deviation increase in a firm's cash flow risk. The two lines in Figure 2 plot the level of sensitivity at each percentile value of a firm's leverage in competitive and concentrated industries. I set a firm's HHI equal to 0.035 in competitive industries and to 0.155 in concentrated industries. These numbers are median HHI values in competitive (HHI<0.1) and

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<sup>13</sup> See Greene (2007) p.869-873 for computing marginal effects of coefficients in Tobit regressions.

concentrated ( $HHI > 0.1$ ) industries respectively.

Figure 2 shows that, while the sensitivity of a firm's dividend payouts to cash flow risk changes little with its leverage in competitive industries, the sensitivity varies significantly with leverage in concentrated industries. In competitive industries, a one standard deviation increase in a firm's cash flow risk decreases a firm's dividend payout by around 20% for any value of a firm's leverage. In concentrated industries, the sensitivity moves toward zero as a firm's leverage increases, due to strategic benefits of debt which reduces a firm's predation risk.

#### 1.4.2.3 Robustness checks: Alternative measures of dividend payouts

While regression results in Table 3 are broadly consistent with the predation risk hypothesis, I also examine whether those results are robust to alternative measures of dividend payouts. Two alternative measures of dividend payouts are Div/TA, common dividends divided by total assets, and Div/ME, common dividends divided by market equity. In models (a) and (b) in Table 5, the dependent variable is Div/TA. Model (a) estimates the baseline model (1) without the third interaction term while model (b) includes all interaction terms. Both models are estimated by Tobit regressions with the dependent variable censored at zero.

Table 5 reports estimation results. Consistent with the first part of the predation risk hypothesis, the signs of the first interaction term,  $CFVOL * HHI$ , in models (a) and (b) are negative and significant at the 1% level. The signs of the second interaction term,  $CFVOL * HHI * Lev$ , are positive in both models, consistent with the second part of the hypothesis. The coefficient is statistically significant at the 1% level in model (a). Models (c) and (d) use Div/ME as the dependent variable. The results in these models are similar to those in models (a) and (b), suggesting that the first and the second parts of the predation risk hypothesis tend to hold irrespective of different measures of a firm's dividend payouts. Overall, the results in Table 5 broadly support the predation risk hypothesis constructed in the section 1.2.

#### 1.4.2.4 Robustness checks: Alternative measures of cash flow risk

Next, I replicate models (c) and (d) in Table 3 with three alternative measures of a firm's industry-level cash flow risk to investigate whether the results in Table 3 are sensitive to different measures of cash flow risk. These three measures are VCFVOL, the (sales) value-weighted average of cash flow volatility of firms in the most recent 10 years in each four-digit SIC industry, MCFVOL, the median of cash flow volatility of firms in the most recent 10 years in each four-digit SIC industry, and ROAVOL, the equally-weighted average of each firm's standard deviation of ROA in the most recent ten years within the firm's four-digit SIC industry. Models (a) and (b) use VCFVOL as a measure of cash flow risk, and models (c) and (d) employ MCFVOL. Models (e) and (f) use ROAVOL, which excludes the effect of interest and taxes, as a measure of cash flow risk. Tobit regression results are reported in Table 6.

The results in Table 6 are similar to those in Table 3. In models (a), (c) and (e) which include the first two interaction terms, the signs of these interaction terms are all consistent with the first and second parts of the hypothesis and they are significant at either the 1% or 5% level, except the first interaction term in model (a) which is only significant at the 10% level. Including the third interaction term in models (b), (d), and (f) reduces statistical significance of estimates, but the results in models (d) and (f) still support the first part of the hypothesis.

Overall, although statistical significance of the first two interaction terms somewhat weakens with alternative measures of cash flow risk, these results are still qualitatively similar to those in Table 3, providing reasonable support for the predation risk hypothesis.

#### 1.4.2.5 Robustness checks: Alternative sub-periods

In this section, I investigate whether full-sample results presented so far are stable over different sub-periods. As Figure 1 shows, mean values of a firm's cash flow risk in both competitive and concentrated industries have substantially increased since 1995. Table 7 presents Tobit regression results on dividend payouts in different sample periods. I use CFVOL as the measure of cash flow risk.

Models (a) and (b) estimate the baseline model during the period 1980-1994 while models (c)

and (d) use the 1995-2009 sample period. In models (a) and (b), the signs of the three interaction terms are consistent with the predation risk hypothesis, but they are far from significant. This result is not unexpected since Figure 2 suggests that there is little time-series or cross-sectional variation in cash flow risk during the period 1980-1994. Thus it is difficult to precisely estimate the coefficients of the three interaction terms which include cash flow risk in this period. In contrast, the result in model (c) strongly supports the first and the second parts of the predation risk hypothesis. The signs of the two interaction terms are consistent with the hypothesis and they are highly significant. Higher time-series variation in cash flow risk in the later period enables more precise identification of the coefficients of the two interaction terms. The sign of the first interaction term in model (d) is also consistent with the first part of the hypothesis, though the signs of two other interaction terms are not consistent with the hypothesis.

Finally, since the measure of strategic interaction, HHI, is updated only every five years by the U.S. Census, I estimate the same baseline model using only six Census years (i.e., 1982, 1987, 1992, 1997, 2002, 2007) in models (e) and (f) to examine whether lack of time-series variation in HHI in years around six Census years affects my estimation results. The regression results in these models suggest that this is not an important issue. The signs of the three interaction terms in both models are consistent with the predation risk hypothesis, and the two interaction terms in model (e) remain significant at the 1% or 5% level.<sup>14</sup>

#### 1.4.2.6 Robustness checks: Endogeneity between dividend and leverage decisions

While the predation risk hypothesis assumes that a firm's debt policy is pre-determined or exogenous, the assumption may be too restrictive. The firm could determine its optimal dividend policy and debt policy jointly. If a firm's current dividend policy and its leverage were endogenous, OLS estimates would be biased even though leverage in my previous regressions is a one-year lag of a firm's book leverage. In order to address this endogeneity concern, I estimate

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<sup>14</sup> As a robustness check, I also estimated model (e) in Table 7 with CFVOL using only the most recent 5 years of a firm's cash flow, instead of using the most recent 10 years. This reduces autocorrelation of CFVOL and mitigates a concern that high autocorrelation of CFVOL, coupled with serial correlation of error terms, may have caused underestimation of standard errors. However, my estimation result with CFVOL using only the most recent 5 years was quite similar to the result reported in Table 7.

the baseline model (1) by GMM.

A challenge for implementing GMM estimation is to find valid instruments which are orthogonal to the error term in an estimating equation. In my framework, valid instruments should be reasonably correlated with leverage but exogenous to a firm's dividend decision. I use two instruments that are motivated by prior literature and the theoretical discussion of my model.

My first instrument is a two-year lag of an equally-weighted average of leverage among all firms in each four-digit SIC industry. Prior literature in corporate finance has used past values of firm-level leverage or current industry-level leverage as instruments for current firm-level leverage. In my model, strategic interaction between firms would affect current leverage and dividends of all firms simultaneously within an industry, so that current industry-level leverage would not be a valid instrument for current firm-level leverage. However, a lagged value of industry-level leverage could be a valid instrument for current firm-level leverage if a firm's adjustment of leverage over time is not too costly. Provided that a firm could freely make its optimal dividend and leverage decisions in each period to finance its investment project, there is little economic reason why past values of firm-level or industry-level leverage should directly affect a firm's current dividend decision.

My second instrument is a firm's non-debt tax shields, following Purnanandam (2009). I use depreciation and amortization divided by total assets as a measure of a firm's non-debt tax shields. This instrument measures a disincentive of using debt. While non-debt tax shields could be a determinant of a firm's capital structure, it is not clear why non-debt tax shields should directly affect a firm's dividend policy. Thus non-debt tax shields could be a reasonable instrument for a firm's debt policy.<sup>15</sup>

With these instruments, I estimate equation (1) by GMM. Models (a) through (c) in Table 8

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<sup>15</sup> Note that the denominator of my primary measure of dividends, Div/E, is operating income *before* depreciation, so this measure should not suffer from simultaneity between depreciation and earnings. For a robustness check, I also conducted subsequent empirical analysis using Div/S, dividends divided by sales, as a dependent variable. This measure should be also immune from a simultaneity issue. My estimation result using this alternative measure was very similar and thus not reported.

present GMM estimation results with a two-year lag of industry-level leverage,  $ILev2$ , and non-debt tax shields,  $Dep$ , as instruments. These two instruments are believed to be reasonably correlated with current leverage but uncorrelated with the error term of the estimating equation. Model (a) only includes the first interaction term that is related to the first part of the predation risk hypothesis. The coefficient of  $CFVOL*HHI$  in model (a) is negative and still significant at the 5% level, suggesting that the first part of the predation risk hypothesis is robust to the potential endogeneity between dividend and leverage decisions.

Model (b) tests the first and the second part of the predation risk hypothesis jointly by GMM. Please note there is one more endogenous variable in model (b) than in model (a):  $CFVOL*HHI*Lev$ , where  $Lev$  is a one-year lag of leverage. In order to instrument this term, I construct another instrument,  $CFVOL*HHI*ILev2$ , where  $ILev2$  is a two-year lag of industry-level leverage. Combined with  $ILev2$  and  $Dep$  in model (a), I use three instruments for two endogenous variables in model (b). The estimated coefficients of the two interaction terms,  $CFVOL*HHI$  and  $CFVOL*HHI*Lev$ , in model (b) are significant at the 1% or 5% level and their signs are consistent with the first and the second part of the predation risk hypothesis.

Finally, model (c) includes all three interaction terms to jointly test the three parts of the hypothesis. Since there are two more endogenous variables,  $CFVOL*HHI*(Lev)^2$  and  $(Lev)^2$  in model (c), I construct two additional instruments,  $CFVOL*HHI*(ILev2)^2$  and  $(ILev2)^2$ , so that I have five instruments for four endogenous variables. In model (c), the coefficient of  $CFVOL*HHI$  is still significant at the 5% level, supporting the first part of the hypothesis. However, similar to the Tobit regression result in model (d) in Table 3, the coefficients of the second and the third interaction terms are no longer significant, though their signs are still consistent with the predation risk hypothesis.

Since there are more instruments than endogenous variables, I can conduct over-identification tests to check validity of instruments in each model. Hansen's J-statistics and associated p-values in all models indicate that instruments are valid. You cannot reject the null that over-identification restrictions are valid at the 10 % level in any models.

I also check whether my results are sensitive to alternative sets of instruments. I estimated model (b) by using three-year, four-year or five-year lags of industry-level leverage with current non-debt tax shields as instruments. In unreported results, I obtained qualitatively similar results.

Finally, I check whether estimated results suffer from weak correlation between instruments and endogenous variables (i.e., weak instrument problem). F-statistics (of first-stage regressions in terms of 2SLS) in all models indicate this is not the case. In unreported results, F-statistics in all models are above ten which is generally thought to be a critical value for a test of weak instruments.

Overall, in models (a) and (b) in Table 8, the coefficients of the first two interaction terms are significant at the 1% or 5% level and their signs are consistent with the first and the second parts of the predation risk hypothesis. Thus I conclude that my previous regression results are reasonably robust to the potential endogeneity problem between dividend and leverage decisions.

#### 1.4.2.7 Extended hypothesis: Total payouts

Up to the previous section, I have examined whether strategic interaction in product markets affects a firm's dividend policy. However, Grullon and Michaely (2002) and Skinner (2008) among others document that U.S. firms have been actively substituting share repurchases for dividends since 1980s. Thus we may not be able to rule out the possibility that firms have substituted share repurchases for dividend payouts as the most important form of distribution. Focusing my analysis solely on the relationship between dividend payouts and cash flow risk may not capture a complete picture of the relationship between a firm's management of predation risk and its payout policy.

However, prior research has already noted that dividends and share repurchases are quite distinct in many respects. In particular, dividends are known to be very sticky over time while share repurchases are highly time-varying. Guay and Harford (2000) and Jagannathan et al (2000) suggest that dividends tend to reflect a permanent component of a firm's cash flow while repurchases distribute more transient shocks. Brav et al (2005) also provide survey evidence that

CFOs have rigid targets for dividends per share while they have flexible goals for share repurchases. These findings would suggest that the predation risk hypothesis is less likely to hold for share repurchases since a high cash flow risk does not necessarily lead to a firm's lower level of repurchases in concentrated industries.

For instance, when a firm with high cash flow risk experiences a temporary increase in cash flow, the firm could increase its distribution temporarily through repurchases while it could still maintain its level of dividend payouts. However, the firm would not necessarily commit to a higher level of repurchases: the firm can change its amount of repurchases depending on the realization of cash flow shock. This flexibility in repurchases might negate the relationship between a firm's management of predation risk and its payout policy when I include share repurchases in the dependent variable in regression analysis.

In Table 9, I examine whether strategic interaction affects a firm's total payout policy, including dividend payouts and net share repurchases. All models run Tobit regressions with a dependent variable truncated at zero in each model. The dependent variable in models (a) and (b) is Total/E, total corporate payouts (i.e., dividends plus net share repurchases) divided by operating income before depreciation. The dependent variable in models (c) and (d) is total corporate payouts divided by total assets, and that in models (e) and (f) is total corporate payouts divided by market equity. The calculation procedure of net share repurchase follows Fama and French (2001) and Skinner (2008).

In models (a), (c) and (e) which include the first two interaction terms, CFVOL\*HHI, the first interaction term, is statistically significant at the 5% level, supporting the first part of the predation risk hypothesis. A firm in a concentrated industry appears to decrease total payouts more than a firm in a competitive industry when its cash flow risk is high. The second interaction term is also significant at the 5% level in models (a) and (c). However, the coefficients of the three interaction terms are no longer significant when I include the third interaction term in models (b), (d) and (f), except model (f) in which the second and the third interaction terms are highly significant with signs that are inconsistent with the predation risk hypothesis.

Overall, while the results on total payouts still support the first part of the predation risk hypothesis, there is little support for the second or the third part of the hypothesis. Management of predation risk does not appear to be strongly influencing a firm's policy on stock repurchases. These results seem to suggest that a firm with high cash flow risk primarily adjusts its dividend policy to manage its predation risk when the firm has greater strategic interaction with rival firms in product markets.

### 1.4.3 Cash flow uncertainty and cash holdings

Empirical evidence presented so far has been consistent with the predation risk hypothesis that a firm with high cash flow risk pays lower dividends when it has greater strategic interaction with rival firms in product markets. However, I have not yet confirmed whether a firm with high cash flow risk actually accumulates more internal funds in order to hedge predation risk. Next, I investigate whether an increase in a firm's cash flow uncertainty affects its accumulation of internal funds, especially cash holdings, more strongly in product markets where strategic interaction among firms is higher. In order to investigate this, I estimate the following baseline model by OLS regressions:

$$\begin{aligned}
 \text{Cash holdings} = & \delta_1 * \text{HHI} + \delta_2 * \text{cash flow risk} \\
 & + \theta_1 * \text{HHI} * \text{cash flow risk} \\
 & + \theta_2 * \text{HHI} * \text{cash flow risk} * \text{Leverage} \\
 & + \theta_3 * \text{HHI} * \text{cash flow risk} * (\text{Leverage})^2 \\
 & + \eta * \text{control variables (including Leverage, (Leverage)}^2)
 \end{aligned} \tag{2}$$

Specification of this baseline model is quite similar to the baseline model (1) estimated in section 1.4.2.1 except that the dependent variable here is cash holdings and control variables for cash holdings are motivated by Opler et al (1999) and Bates et al (2009). Haushalter et al (2007) also investigate whether firms manage predation risk in concentrated industries, and they interpret a positive sign of  $\delta_1$  as evidence of hedging of predation risk. However, as discussed in

the section 1.4.2.1, the degree of product market competition could also affect agency conflicts or a firm's ability to reduce cash flow risk other than a firm's predation risk.

In order to identify the effect of a firm's predation risk, I include the three interaction terms between HHI and cash flow risk (and leverage). These interaction terms would enable me to assess whether an increase in cash flow risk affects a firm's cash holdings differently between competitive and concentrated industries. If there is a difference in the sensitivity of cash holdings to cash flow risk between competitive and concentrated industries, then a firm's management of predation risk seems most likely to explain the difference, since it is not obvious why alternative explanations such as agency conflicts or a firm's ability to reduce cash flow risk could account for this difference.

If the predation risk hypothesis is true, the signs of the three interaction terms in the regression of cash holdings should be opposite to those in the regression of dividend payouts since a decrease (increase) in dividend payouts should be accompanied by an increase (decrease) in cash holdings under the hypothesis. Thus predicted signs of the three interaction terms under the predation risk hypothesis are given as follows:

- $\theta_1 > 0$
- $\theta_2 < 0$
- $\theta_3 > 0$

Table 10 reports OLS regression results. Cash flow risk is proxied by CFVOL, the equally-weighted average of each firm's standard deviation of cash flow in the most recent ten years within each four-digit SIC industry. I perform OLS regressions to examine whether the sensitivity of a firm's cash holdings to cash flow risk is affected by its strategic interaction with rival firms in product markets. In models (a), (b) and (c), I estimate equation (2) using the sample with zero dividend payouts (i.e., dividend non-payers). Models (d), (e) and (f) use the sample with positive dividend payouts (i.e., dividend payers). In models (a) and (d), I run regressions without the three interaction terms in order to compare my results with previous studies on

corporate cash holdings.

As expected, the coefficients of cash flow risk,  $\delta_2$ , in models (a) and (d) are positive, indicating that a firm with high industry-level cash flow risk accumulates more cash (Opler et al (1999), Bates et al (2009)). Note that, while the sensitivity of cash holdings to cash flow risk in model (a) (i.e., dividend non-payers) is positive and statistically significant at the 1% level, the sensitivity in model (d) (i.e., dividend payers) is significant only at the 10% level (Han and Qiu (2007)). This result might be because dividend payers are less financially constrained so that they have less incentive to increase cash balances in response to a change in cash flow risk. Many previous studies including Almeida et al (2004), Han and Qiu (2007), Denis and Sibilkov (2010) have used a firm's payout ratio as a measure of the level of firm's financial constraints, and Denis and Sibilkov (2010) note that a simple dividend dummy variable also works as a measure of firm's financial constraints in their study.

Now, I investigate whether the sensitivity of a firm's cash holdings to cash flow risk is affected by strategic interaction in product markets. Models (b) and (c) estimate equation (2) for the sample with zero dividend payouts. In both models in Table 10, the signs of all interaction terms are consistent with the predation risk hypothesis. Besides, the first and the second interaction terms are significant at the 1% or 5% even after including the third interaction term in model (c). Models (e) and (f) estimate the same equation for the sample with positive dividend payouts. In both models, the first two interaction terms are significant at the 1% or 5% level. Besides, the signs of all interaction terms are consistent with those predicted by the hypothesis and are opposite to those in the regressions of dividend payouts. Estimation results using other measures of cash flow risk are also quite similar (thus not reported). These results seem to suggest that even firms which are relatively financially unconstrained (i.e., dividend payers) are still sensitive to cash flow risk and adjust their cash holdings in response to a change in risk if they have high strategic interaction with rival firms in product markets.

Finally, economic impacts of strategic interaction in product markets on a firm's management of cash holdings are also non-trivial. In model (e) (i.e., dividend payers), a one standard

deviation increase of cash flow uncertainty increases cash holdings (divided by total assets) by 4.9 percent in competitive industries but by 20.3 percent in concentrated industries for a firm with the 25<sup>th</sup> percentile value of leverage, when other financial characteristics of the firm are held constant at sample median values. However, these sensitivities also depend on a firm's leverage. While the sensitivity of a firm's cash holdings to cash flow risk in competitive industries changes little with leverage, the sensitivity varies significantly with a firm's debt position in concentrated industries. For a firm with the median level of leverage, a one standard deviation increase of a firm's cash flow risk increases cash holdings by 17.2 percent in concentrated industries after controlling for other firm characteristics. However, a firm with the 75<sup>th</sup> percentile value of leverage increases cash holdings only by 11.6 percent in response to a one standard deviation increase in cash flow uncertainty. These results give support for the first and the second parts of the predation risk hypothesis that a firm manages its predation risk by adjusting its internal funds, leading to a change in its dividend payouts.

## 1.5 Conclusion

This paper investigates whether a firm's strategic interaction with rival firms affects the sensitivity of a firm's dividend payouts to its cash flow uncertainty. Consistent with the predation risk hypothesis, I document that the sensitivity of a firm's dividend payouts to cash flow risk is higher when the firm has greater strategic interaction with rival firms. A firm manages its predation risk by adjusting its internal funds, leading to a change in its dividend payouts. In addition, I show that the sensitivity of dividend payouts to cash flow risk decreases with leverage, consistent with the capital structure literature that identifies strategic benefits of debt on product market competition in concentrated industries. Overall, these findings suggest that product market competition is an important determinant of dividend policy, and a firm's management of predation risk generates an equilibrium relationship between a firm's cash flow risk, strategic environment, leverage, and payout policy.

Table 1: Descriptive statistics

<b>variable</b>	<b>mean</b>	<b>median</b>	<b>Std.dev</b>	<b>25<sup>th</sup> percentile</b>	<b>75<sup>th</sup> percentile</b>	<b>N</b>
<i>Payout measures:</i>						
<b>Div/E</b>	.0530918	0	.0908075	0	.0885319	59463
<b>Div/TA</b>	.0075975	0	.0131541	0	.0121602	59082
<b>Div/ME</b>	.0091543	0	.0153194	0	.0153412	59092
<b>Total/E</b>	.1034151	0	.1774651	0	.1460017	53036
<b>Total/TA</b>	.0149359	0	.0268325	0	.019968	53655
<b>Total/ME</b>	.0174407	0	.0288559	0	.0264395	53658
<i>Strategic interaction:</i>						
<b>HHI</b>	.0603612	.0423	.0569596	.0228	.07535	27148
<i>Cash flow risk:</i>						
<b>CFVOL</b>	.0958713	.0755073	.0774658	.0380424	.1256479	58209
<b>VCFVOL</b>	.0413089	.0334091	.0237607	.0240727	.0547959	58011
<b>MCFVOL</b>	.0557383	.0466609	.0356298	.030414	.0686563	58146
<b>ROAVOL</b>	.1089728	.0929573	.0736116	.0541536	.1384633	58208
<i>Other firm characteristics:</i>						
<b>Lev</b>	.1723746	.1453929	.1542697	.0290556	.2736983	58124
<b>AGR</b>	.1280433	.0630427	.3369935	-.033539	.1896742	58285
<b>InAsset</b>	4.767224	4.588339	2.054239	3.228232	6.186713	58257
<b>Profitability</b>	.0095392	.0635765	.1800467	.0002361	.1011487	55163
<b>MBR</b>	1.798704	1.340107	1.35574	1.021206	2.001791	58286
<b>RE/TA</b>	-.0734473	.1952227	.9595286	-.0783327	.3886559	58319
<b>Cash/TA</b>	.1534922	.0751596	.1874521	.0221991	.2132219	58264
<b>CF/TA</b>	.0319469	.0740483	.1632371	.0198834	.1155462	58262
<b>NWC/TA</b>	.1736522	.1704193	.1690011	.0531742	.2924126	57354
<b>CAPEX/TA</b>	.0548664	.042876	.044896	.0229355	.0732187	57758
<b>RD/Sales</b>	.1189707	.0139395	.5051328	0	.0640597	58478
<b>ACQ/TA</b>	.0165159	0	.0451278	0	.003614	55702

Table 2: Simple correlation coefficients between corporate payouts and four measures of industry-level cash flow uncertainty

## (a) Div/E and cash flow risk

	Competitive industries (HHI<0.1)	Concentrated industries (HHI>0.1)
<i>Cash flow risk measures:</i>		
CFVOL	-0.1575	-0.3138
VCFVOL	-0.1788	-0.2937
MCFVOL	-0.2016	-0.3194
ROAVOL	-0.1575	-0.3020

## (b) Total/E and cash flow risk

	Competitive industries (HHI<0.1)	Concentrated industries (HHI>0.1)
<i>Cash flow risk measures:</i>		
CFVOL	-0.0909	-0.1677
VCFVOL	-0.1040	-0.1150
MCFVOL	-0.1277	-0.1475
ROAVOL	-0.0997	-0.1722

Table 3: Tobit regressions to examine the relation between dividend payouts (Div/E), industry-level cash flow uncertainty (CFVOL), and Herfindahl-Hirschman Index (HHI)

Dep.var = Div/E	(a)	(b)	(c)	(d)
HHI	-0.017 (0.45)	0.087 (1.60)	0.088* (1.70)	0.083 (1.61)
CFVOL	-0.258*** (4.21)	-0.150** (2.08)	-0.147** (2.09)	-0.142** (2.03)
CFVOL*HHI		-2.162** (2.28)	-3.973*** (3.34)	-4.063*** (2.88)
CFVOL*HHI*Lev			9.445*** (2.62)	12.491 (1.31)
CFVOL*HHI*(Lev) <sup>2</sup>				-7.395 (0.45)
Lev	-0.110*** (6.14)	-0.111*** (6.21)	-0.140*** (6.65)	-0.017 (0.31)
(Lev) <sup>2</sup>				-0.257*** (2.71)
AGR	-0.059*** (9.91)	-0.059*** (9.92)	-0.059*** (9.96)	-0.059*** (9.85)
InAsset	0.030*** (20.01)	0.030*** (19.95)	0.030*** (19.94)	0.029*** (19.40)
Profitability	0.057* (1.95)	0.056* (1.91)	0.054* (1.83)	0.056* (1.89)
MBR	-0.005* (1.91)	-0.006* (1.94)	-0.005* (1.86)	-0.005 (1.62)
RE/TA	0.253*** (19.27)	0.252*** (19.27)	0.251*** (19.29)	0.252*** (19.27)
Constant	-0.105*** (6.83)	-0.110*** (7.12)	-0.104*** (6.69)	-0.112*** (6.98)
Observations	23004	23004	23004	23004
<b>Robust t statistics in parentheses</b>				
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>				

Table 4: Tobit regressions to examine the relation between dividend payouts (Div/E), industry-level cash flow uncertainty (CFVOL), and Herfindahl-Hirschman Index (HHI)

Dep.var = Div/E	(a) Large firms	(b) Large firms	(c) Net Leverage	(d) Net Leverage
HHI	0.045 (0.83)	0.038 (0.69)	0.091* (1.75)	0.093* (1.78)
CFVOL	-0.110 (1.58)	-0.105 (1.53)	-0.144** (2.05)	-0.141** (2.00)
CFVOL*HHI	-4.449*** (3.56)	-5.149*** (3.16)	-2.574*** (2.92)	-3.176*** (2.97)
CFVOL*HHI*Lev	9.823*** (2.95)	21.981* (1.78)		
CFVOL*HHI*(Lev) <sup>2</sup>		-26.921 (1.18)		
CFVOL*HHI*NLev			6.320** (2.34)	5.278** (2.22)
CFVOL*HHI*(NLev) <sup>2</sup>				10.888 (1.34)
Lev	-0.123*** (4.43)	0.041 (0.54)		
(Lev) <sup>2</sup>		-0.313** (2.36)		
NLev			-0.065*** (4.45)	-0.053*** (3.34)
(NLev) <sup>2</sup>				-0.148*** (3.40)
AGR	-0.053*** (8.04)	-0.053*** (7.90)	-0.055*** (9.47)	-0.057*** (9.77)
InAsset	0.024*** (8.58)	0.023*** (8.13)	0.030*** (19.61)	0.029*** (19.63)
Profitability	-0.176*** (4.48)	-0.170*** (4.33)	0.034 (1.15)	0.043 (1.47)
MBR	0.007** (2.05)	0.008** (2.51)	-0.004 (1.55)	-0.004 (1.50)
RE/TA	0.194*** (11.31)	0.191*** (11.08)	0.268*** (21.01)	0.261*** (19.93)
Constant	-0.038 (1.47)	-0.047* (1.80)	-0.130*** (8.77)	-0.120*** (7.98)
Observations	8788	8788	22759	22759
<b>Robust t statistics in parentheses</b>				
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>				

Table 5: Tobit regressions to examine the relation between alternative measures of dividend payouts (Div/TA, Div/ME), industry-level cash flow uncertainty (CFVOL), and Herfindahl-Hirschman Index (HHI)

Dep.Var	(a) Div/TA	(b) Div/TA	(c) Div/ME	(d) Div/ME
HHI	0.012 (1.61)	0.011 (1.51)	0.020** (2.33)	0.019** (2.21)
CFVOL	-0.022** (2.08)	-0.021** (2.01)	-0.026** (2.40)	-0.025** (2.31)
CFVOL*HHI	-0.649*** (3.76)	-0.673*** (3.20)	-0.624*** (3.56)	-0.543*** (2.71)
CFVOL*HHI*Lev	1.602*** (3.20)	2.163 (1.64)	1.261** (2.07)	0.523 (0.37)
CFVOL*HHI*(Lev) <sup>2</sup>		-1.295 (0.58)		1.412 (0.56)
Lev	-0.022*** (7.55)	-0.004 (0.60)	-0.015*** (4.17)	0.026*** (2.95)
(Lev) <sup>2</sup>		-0.037*** (2.88)		-0.084*** (4.89)
AGR	-0.011*** (12.72)	-0.011*** (12.57)	-0.009*** (10.17)	-0.009*** (9.99)
InAsset	0.004*** (19.79)	0.004*** (19.29)	0.006*** (22.45)	0.005*** (21.43)
Profitability	0.053*** (11.16)	0.053*** (11.21)	0.043*** (8.64)	0.043*** (8.75)
MBR	0.002*** (4.01)	0.002*** (4.24)	-0.007*** (13.77)	-0.007*** (13.54)
RE/TA	0.035*** (19.01)	0.035*** (19.02)	0.037*** (17.70)	0.037*** (17.71)
Constant	-0.018*** (8.07)	-0.019*** (8.37)	-0.005** (2.10)	-0.008*** (2.99)
Observations	22836	22836	22793	22793
<b>Robust t statistics in parentheses</b>				
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>				

Table 6: Tobit regressions to examine the relation between dividend payouts (Div/E), three alternative measures of industry-level cash flow uncertainty (RISK=VCFVOL, MCFVOL, ROAVOL), and Herfindahl-Hirschman Index (HHI)

Dep.var = Div/E	(a) RISK=VCFVOL	(b) RISK=VCFVOL	(c) RISK=MCFVOL	(d) RISK=MCFVOL	(e) RISK=ROAVOL	(f) RISK=ROAVOL
HHI	0.059 (0.90)	0.059 (0.88)	0.059 (1.00)	0.056 (0.92)	0.063 (1.12)	0.058 (1.02)
RISK	-0.916*** (4.39)	-0.883*** (4.21)	-0.764*** (5.16)	-0.742*** (4.99)	-0.204*** (2.91)	-0.197*** (2.82)
RISK*HHI	-4.094* (1.78)	-3.165 (1.33)	-3.801** (2.22)	-3.583** (1.97)	-2.775*** (2.78)	-2.762** (2.49)
RISK*HHI*Lev	11.590** (1.99)	-3.068 (0.20)	11.683*** (2.67)	9.934 (0.85)	7.919*** (2.75)	9.562 (1.31)
RISK*HHI*(Lev) <sup>2</sup>		32.050 (1.10)		3.186 (0.16)		-4.654 (0.35)
Lev	-0.139*** (6.62)	0.015 (0.29)	-0.144*** (6.96)	-0.018 (0.34)	-0.143*** (6.67)	-0.022 (0.40)
(Lev) <sup>2</sup>		-0.326*** (3.36)		-0.265*** (2.85)		-0.253*** (2.62)
AGR	-0.059*** (9.96)	-0.059*** (9.86)	-0.059*** (9.94)	-0.058*** (9.84)	-0.059*** (9.97)	-0.059*** (9.86)
InAsset	0.029*** (19.77)	0.028*** (19.17)	0.029*** (19.65)	0.029*** (19.12)	0.030*** (20.04)	0.029*** (19.47)
Profitability	0.061** (2.10)	0.063** (2.15)	0.054* (1.86)	0.056* (1.92)	0.053* (1.83)	0.055* (1.90)
MBR	-0.007** (2.45)	-0.006** (2.22)	-0.006** (2.06)	-0.005* (1.84)	-0.005* (1.73)	-0.004 (1.51)
RE/TA	0.249*** (19.51)	0.250*** (19.47)	0.248*** (19.16)	0.249*** (19.15)	0.251*** (19.36)	0.252*** (19.36)
Constant	-0.081*** (5.05)	-0.091*** (5.54)	-0.081*** (5.02)	-0.089*** (5.35)	-0.097*** (6.14)	-0.105*** (6.43)
Observations	23124	23124	23022	23022	22988	22988

Robust t statistics in parentheses  
\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 7: Tobit regressions to examine the stability of the relation between dividend payouts (Div/E), industry-level cash flow uncertainty (CFVOL), and Herfindahl-Hirschman Index (HHI) over different sample periods

Dep.var = Div/E	(a) 1980-1994	(b) 1980-1994	(c) 1995-2009	(d) 1995-2009	(e) Census yrs.	(f) Census yrs.
<b>HHI</b>	0.013 (0.19)	0.006 (0.08)	0.139* (1.74)	0.151* (1.86)	0.144** (2.09)	0.138** (1.99)
<b>CFVOL</b>	-0.286** (2.24)	-0.277** (2.20)	-0.082 (0.91)	-0.067 (0.74)	-0.122 (1.40)	-0.118 (1.36)
<b>CFVOL*HHI</b>	-0.650 (0.37)	-2.103 (0.88)	-7.124*** (4.12)	-6.120*** (3.31)	-5.626*** (3.34)	-6.498*** (3.11)
<b>CFVOL*HHI*Lev</b>	3.194 (0.72)	23.657 (1.55)	13.051** (2.22)	-2.979 (0.19)	11.317** (2.53)	25.851* (1.95)
<b>CFVOL*HHI*(Lev)<sup>2</sup></b>		-47.198* (1.66)		33.835 (1.35)		-32.592 (1.42)
<b>Lev</b>	-0.127*** (5.15)	-0.075 (1.16)	-0.145*** (4.59)	0.106 (1.31)	-0.140*** (5.27)	-0.101 (1.51)
<b>(Lev)<sup>2</sup></b>		-0.107 (0.90)		-0.516*** (3.66)		-0.079 (0.67)
<b>AGR</b>	-0.049*** (6.19)	-0.048*** (6.09)	-0.068*** (8.18)	-0.068*** (8.07)	-0.057*** (5.48)	-0.057*** (5.41)
<b>InAsset</b>	0.031*** (19.82)	0.030*** (19.35)	0.028*** (11.44)	0.027*** (10.84)	0.031*** (17.23)	0.030*** (16.93)
<b>Profitability</b>	0.049 (1.28)	0.049 (1.28)	0.037 (0.90)	0.041 (1.00)	0.129*** (2.73)	0.130*** (2.74)
<b>MBR</b>	-0.008** (2.10)	-0.007* (1.89)	0.000 (0.07)	0.001 (0.30)	-0.005 (1.46)	-0.005 (1.36)
<b>RE/TA</b>	0.270*** (16.01)	0.271*** (16.04)	0.235*** (14.13)	0.235*** (14.07)	0.252*** (15.12)	0.251*** (15.08)
<b>Constant</b>	-0.122*** (7.39)	-0.125*** (7.27)	-0.177*** (6.46)	-0.186*** (6.74)	-0.211*** (9.52)	-0.211*** (9.40)
<b>Observations</b>	13003	13003	10001	10001	4516	4516
<b>Robust t statistics in parentheses</b>						
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>						

Table 8: GMM estimation to examine the relation between dividend payouts (Div/E), industry-level cash flow uncertainty (CFVOL), and Herfindahl-Hirschman Index (HHI)

Dep.var = Div/E	(a)	(b)	(c)
HHI	0.041 (1.22)	0.031 (0.91)	0.030 (0.84)
CFVOL	-0.090*** (2.65)	-0.095*** (2.83)	-0.095*** (2.82)
CFVOL*HHI	-0.876** (2.46)	-1.689*** (3.19)	-1.824** (2.52)
CFVOL*HHI*Lev		5.774** (1.98)	9.122 (0.74)
CFVOL*HHI*(Lev) <sup>2</sup>			-8.189 (0.29)
Lev	-0.190*** (10.17)	-0.206*** (9.72)	-0.201** (2.28)
(Lev) <sup>2</sup>			-0.014 (0.09)
AGR	-0.047*** (17.56)	-0.047*** (17.55)	-0.047*** (17.42)
InAsset	0.017*** (17.66)	0.017*** (17.58)	0.017*** (16.09)
Profitability	0.012 (1.19)	0.009 (0.89)	0.009 (0.94)
MBR	0.004** (2.44)	0.004*** (2.64)	0.004*** (2.60)
RE/TA	0.022*** (7.00)	0.022*** (7.01)	0.022*** (6.98)
Constant	0.013 (1.00)	0.016 (1.28)	0.017 (1.23)
Observations	21855	21855	21855
<b>Endogenous variables</b>	Lev	Lev CFVOL*HHI*Lev	Lev, (Lev) <sup>2</sup> CFVOL*HHI*Lev CFVOL*HHI*(Lev) <sup>2</sup>
<b>Instruments</b>	lLev2 Dep	lLev2 Dep CFVOL*HHI*lLev2	lLev2, (lLev2) <sup>2</sup> Dep CFVOL*HHI*lLev2 CFVOL*HHI*(lLev2) <sup>2</sup>
<b>Hansen's J-statistics (1)</b>	0.98 (p=0.32)	1.34 (p=0.25)	1.63 (p=0.20)
<b>Robust z statistics in parentheses</b>			
* significant at 10%; ** significant at 5%; *** significant at 1%			

Table 9: Tobit regressions to examine the relation between three measures of total corporate payouts (Total/E, Total/TA, Total/ME), industry-level cash flow uncertainty (CFVOL), and Herfindahl-Hirschman Index (HHI)

Dep.var	(a) Total/E	(b) Total/E	(c) Total/TA	(d) Total/TA	(e) Total/ME	(f) Total/ME
HHI	0.077 (1.18)	0.075 (1.15)	0.011 (1.03)	0.011 (1.04)	0.024** (2.14)	0.024** (2.15)
CFVOL	-0.168** (2.11)	-0.165** (2.08)	-0.023* (1.73)	-0.022* (1.69)	-0.027** (2.19)	-0.026** (2.10)
CFVOL*HHI	-3.116** (2.48)	-2.381* (1.73)	-0.446** (2.53)	-0.287 (1.54)	-0.428** (2.39)	-0.156 (0.84)
CFVOL*HHI*Lev	8.336** (2.14)	-2.029 (0.20)	1.161** (2.09)	-1.402 (0.94)	0.462 (0.72)	-3.937** (2.50)
CFVOL*HHI*(Lev) <sup>2</sup>		22.111 (1.16)		5.625* (1.79)		9.600*** (2.90)
Lev	-0.303*** (11.02)	-0.152** (2.35)	-0.053*** (13.60)	-0.029*** (3.11)	-0.040*** (9.14)	0.007 (0.69)
(Lev) <sup>2</sup>		-0.315*** (2.72)		-0.050*** (2.97)		-0.099*** (4.76)
AGR	-0.183*** (17.74)	-0.182*** (17.69)	-0.032*** (18.63)	-0.032*** (18.58)	-0.028*** (16.28)	-0.028*** (16.20)
InAsset	0.040*** (21.16)	0.039*** (20.65)	0.006*** (20.70)	0.006*** (20.35)	0.007*** (22.52)	0.007*** (21.65)
Profitability	0.434*** (9.58)	0.436*** (9.63)	0.093*** (12.26)	0.093*** (12.29)	0.077*** (10.42)	0.078*** (10.48)
MBR	-0.007* (1.77)	-0.007 (1.61)	0.005*** (5.77)	0.005*** (5.88)	-0.008*** (12.85)	-0.008*** (12.69)
RE/TA	0.246*** (12.90)	0.246*** (12.88)	0.030*** (11.87)	0.030*** (11.86)	0.030*** (10.86)	0.030*** (10.86)
Constant	-0.107*** (5.49)	-0.117*** (5.81)	-0.017*** (5.70)	-0.019*** (6.05)	0.003 (0.86)	-0.000 (0.12)
Observations	21117	21117	21182	21182	21098	21098

Robust t statistics in parentheses  
\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 10: OLS regressions to examine the relation between cash holdings (Cash/TA), industry-level cash flow uncertainty (CFVOL), and Herfindahl-Hirschman Index (HHI)

	(a)	(b)	(c)	(d)	(e)	(f)
Dividend payouts	Zero	Zero	Zero	Positive	Positive	Positive
HHI	-0.004 (0.09)	-0.037 (0.56)	-0.052 (0.79)	0.025 (0.88)	-0.062* (1.72)	-0.047 (1.35)
CFVOL	0.119*** (2.73)	0.096* (1.72)	0.077 (1.44)	0.086* (1.67)	-0.009 (0.18)	-0.012 (0.24)
CFVOL*HHI		1.764** (2.07)	1.888** (2.05)		3.854*** (3.42)	4.571*** (3.04)
CFVOL*HHI*Lev		-8.759*** (3.55)	-15.645** (2.25)		-9.480** (2.37)	-23.489** (1.98)
CFVOL*HHI*(Lev) <sup>2</sup>			22.715* (1.66)			33.029 (1.56)
Lev	-0.277*** (16.10)	-0.239*** (12.63)	-0.610*** (11.01)	-0.256*** (13.97)	-0.232*** (11.62)	-0.536*** (9.92)
(Lev) <sup>2</sup>			0.696*** (8.05)			0.680*** (7.26)
InAsset	0.002 (0.80)	0.001 (0.76)	0.002 (1.27)	-0.023*** (12.61)	-0.022*** (12.67)	-0.020*** (11.90)
MBR	0.028*** (9.75)	0.027*** (9.78)	0.026*** (9.19)	0.022*** (8.01)	0.022*** (8.00)	0.019*** (6.90)
CF/TA	0.045* (1.90)	0.048** (2.05)	0.049** (2.09)	-0.122*** (2.74)	-0.123*** (2.77)	-0.111** (2.58)
NWC/TA	-0.266*** (15.64)	-0.265*** (15.69)	-0.259*** (15.67)	-0.281*** (14.14)	-0.279*** (14.11)	-0.270*** (14.07)
CAPEX/TA	-0.592*** (11.08)	-0.584*** (10.94)	-0.556*** (10.75)	-0.620*** (14.21)	-0.619*** (14.27)	-0.589*** (14.21)
RD/Sales	0.100*** (6.20)	0.099*** (6.39)	0.097*** (6.19)	0.309*** (3.21)	0.281*** (2.96)	0.278*** (3.03)
ACQ/TA	-0.328*** (11.82)	-0.327*** (11.85)	-0.328*** (11.96)	-0.294*** (14.90)	-0.291*** (14.88)	-0.281*** (14.94)
Constant	0.171*** (10.44)	0.164*** (9.81)	0.200*** (11.40)	0.336*** (16.90)	0.334*** (17.03)	0.341*** (17.75)
Observations	9364	9364	9364	12425	12425	12425
R-squared	0.396	0.399	0.416	0.378	0.381	0.403
Robust t statistics in parentheses						
* significant at 10%; ** significant at 5%; *** significant at 1%						

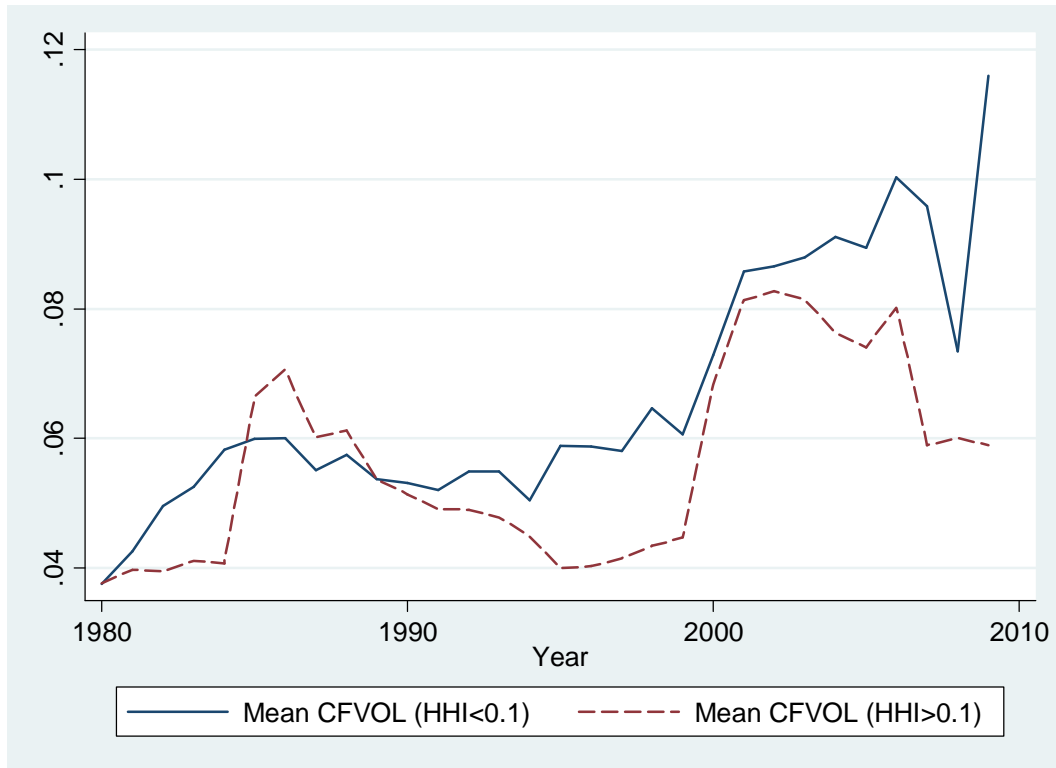


Figure 1: Average cash flow risk in competitive and concentrated industries during 1980-2009

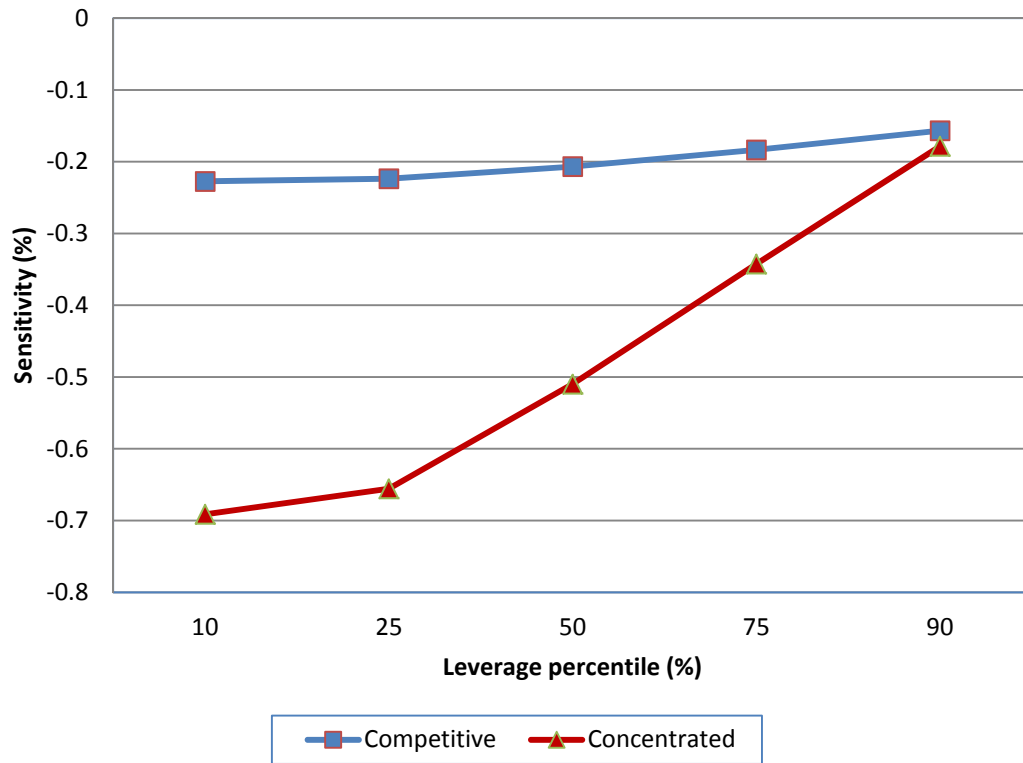


Figure 2: The sensitivity of a firm's dividend payouts to cash flow risk in competitive and concentrated industries

## **Chapter 2: Do labor unions affect a firm's payout policy? : Operating leverage versus rent extraction**

### 2.1 Introduction

In a world with frictionless capital markets, there would be no incentive for a firm to hedge cash flow risk since the firm can raise external capital to mitigate an adverse cash flow shock. When external financing is costly, one possible way for a firm to mitigate its cash flow risk is to exchange its fixed costs for variable costs. For instance, if a firm could tie a firm's labor expenses to its sales revenue, the firm could decrease its operating leverage derived from fixed labor costs and make the cash flow process less vulnerable to a demand or revenue shock. This practice of making a firm's cost structure more variable with its sales revenue could make a firm's operation more flexible and reduce cash flow risk. However, labor unions could reduce a firm's operational flexibility and increase operating risk, since it is usually difficult to lay off a unionized labor force and thus adjust labor expenses. For instance, Chen, Kacperczyk, and Ortiz-Molina (2010) provides evidence that a loss of operational flexibility originating from the presence of labor unions significantly increases a firm's cost of equity.<sup>16</sup>

Despite ample evidence of the effects of labor unions on various other dimensions of corporate finance, relatively little attention has been paid to the relationship between labor unions and a firm's payout policy.<sup>17</sup> Although a few papers have examined the relationship between labor unions and a firm's dividend policy, existing empirical findings on the relationship are generally weak.<sup>18</sup> Some questions naturally arise from previous findings. Why do not labor unions seem to

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<sup>16</sup> A recent news article in WSJ on 13/Jan/2011 also suggests that labor unions put a significant burden on operating flexibility on auto manufacturing companies. In the article, Chrysler CEO Sergio Marchionne says, "We need to somehow link the performance of the business to the workers. I am quite willing to start working with the UAW to try and get this done. "

<sup>17</sup> For instance, Matsa (2010) finds evidence that labor unions tend to affect a firm's debt policy as the firm strategically increases debt in order to derive concessions from negotiations with labor unions. In a similar vein, Klasa, Maxwell, and Ortiz-Molina (2009) show that a firm with a strong labor union tries to reduce its cash holdings to shelter internal resources from union demands.

<sup>18</sup> For instance, DeAngelo and DeAngelo (1990, 1991) argue that a firm may strategically reduce dividend payouts in order to derive concessions from collective bargaining with labor unions, but they found only modest support for a strategic role of dividends in their case studies. They conclude that a strategic role of dividend reduction on collective bargaining with unions is at

matter for a firm's dividend policy while they tend to affect other corporate financial decisions such as capital structure? Do we observe a weak relationship between labor unions and payout policy because a firm with a strong labor union has both an incentive to decrease its dividends and to increase the dividends that tend to balance out? If so, is there any way to empirically distinguish one incentive from another?

The objective of this paper is to identify two distinct effects of labor unions on a firm's payout policy and examine how labor unions affect a firm's dividend policy and payout flexibility through these two effects.<sup>19</sup> To start with, I investigate how labor unions affect a firm's dividend policy by explicitly recognizing two distinct effects of labor unions on a firm's dividend policy. First, since a labor union creates greater operating and cash flow risk for a firm, the firm with a strong labor union would have a high probability of dividend omission and/or that of losing a valuable investment opportunity in future. Since these are costly for the firm, a labor union effectively increases the marginal cost of paying an additional dollar of a dividend. Second and conversely, a strong labor union would induce a firm to commit to high dividend payouts since dividends would enable the firm to shield its resources from union capture. In other words, a labor union would increase the marginal benefit of paying an additional dollar of a dividend for the firm. Since a labor union increases the marginal cost and the marginal benefit of paying an additional dollar of a dividend, the *net* marginal benefit could be small so that we might not find any effect of a labor union on dividend payouts. A question is how to separately identify the effects of a labor union on the marginal cost and the marginal benefit of paying an additional dollar of a dividend.

I address this question by focusing on differential effects of a firm's profitability on the marginal benefit of paying an additional dollar of a dividend. More precisely, I argue that a labor union should increase the marginal benefit only if a firm's profitability is high, since a profitable firm

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best of second-order importance. Matsa (2006) also empirically examined the effects of labor unions on dividend payouts, and he found an insignificantly negative relationship between labor unions and dividend policy. Finally, Rosett (2003) found that a firm's labor costs and employment levels significantly reduce dividend yields although it is not clear whether these employment characteristics capture a firm's operational risk associated with labor unions. Overall, previous literature provided only weak evidence on a connection between labor unions and a firm's dividend policy.

<sup>19</sup> I define a firm's payout flexibility as a ratio of stock repurchases to total payouts at year  $t$ .

would like to shield its resources from union capture by committing to high cash distributions to shareholders. Conversely, a labor union should not much affect the marginal benefit of paying an additional dollar of a dividend for low profitability firms, since these firms would have few internal resources to protect from union capture. Assuming that a labor union increases the marginal cost of paying an additional dollar of a dividend in similar magnitudes for all firms, these differential effects of a firm's profitability on the marginal benefit would generate predictions on the relationship between a labor union and dividend payouts.

I conjecture that the total effect of a labor union on a firm's dividend payouts should depend on the firm's profitability. Unless a firm is highly profitable, there should be a negative relation between a firm's dividend payouts and union coverage, since a labor union increases the marginal cost of paying an additional dollar of a dividend while it should not much affect the marginal benefit for low profitability firms. However, if a firm is highly profitable, the relation between dividends and unionization could be positive since a labor union increases not only the marginal cost but also the marginal benefit of paying an additional dollar of a dividend, and an increase in the marginal benefit could be greater than an increase in the marginal cost. Thus the sensitivity of a firm's dividends to union coverage may be positive or negative, depending on the firm's profitability. In other words, the effects of a firm's profitability on the relationship between labor unions and a firm's dividend policy are not homogeneous. Failing to appropriately control for the heterogeneous effects of a firm's profitability would obscure the true relationship between the strength of a labor union and a firm's dividend policy.

Using industry-level union coverage data for the sample of U.S. public firms during 1983-2009, I find strong evidence that the relationship between labor unions and a firm's dividend policy depends on a firm's profitability. A firm with a stronger labor union tends to pay lower dividends when the firm is not highly profitable. However, if a firm is highly profitable, the firm with a stronger labor union commits to higher dividend payouts. This is consistent with the conjecture that the sensitivity of a firm's dividend payouts to labor union coverage should depend on the firm's profitability. If a firm is highly profitable, the firm could choose an inflexible payout policy by committing to high dividend payouts at the cost of losing operating flexibility.

These results are robust to alternative measures of dividend payouts, different sub-periods, or different estimation methods. They are statistically significant regardless of any measure of dividend payouts and are stable over time. Statistical significance of my empirical results strengthens when I take into account a discontinuity of an empirical distribution of dividend measures at zero by Tobit regressions.

These findings are not only statistically significant but also economically important. With a primary measure of dividend payouts, one standard deviation increase in the industry-level union coverage ratio decreases a firm's dividend payouts by 8.7 percent if the firm is moderately profitable. However, the same size of an increase in the union coverage ratio *raises* dividend payouts by 11.0 percent if the firm is highly profitable.

While a firm's profitability seems to affect the sensitivity of its dividend payouts to union coverage, I next examine whether labor unions affect a firm's choice of payout method between dividend payouts and stock repurchases. Previous literature documented that a firm with higher cash flow risk tends to choose a more flexible payout method (Jagannathan, Stephens, and Weisbach (2000), Guay and Harford (2000)). Given a firm's high risk originating from operating inflexibility associated with a strong presence of a labor union, the firm would like to substitute stock repurchases for dividend payouts to reduce committed payouts to shareholders.

While an increase in operating risk originating from a labor union should affect the composition of payout policy, it is not clear whether a profitable firm's desire to shield resources from a labor union affects the composition of total payouts. Although a profitable firm with a strong labor union would commit to high dividend payouts, the firm could also make a high amount of stock repurchases due to its high profit and high cash flow variance (i.e., potential of high excess cash flow) derived from a labor union. A profitable firm with a strong labor union could increase both dividend payouts and stock repurchases together, so that the firm's payout composition would not change with its profitability. I expect that a firm with a strong labor union, regardless of its profitability, would primarily choose high payout flexibility by making a relatively high share of its cash distributions through repurchases.

My empirical results indeed confirm the conjecture that the strength of a labor union is positively associated with a firm's payout flexibility. A firm with a stronger labor union makes a relatively higher share of its distribution through stock repurchases than dividend payouts. A firm appears to choose a more flexible payout method when it faces higher operating rigidity originating from a labor union.

Economic impacts are also non-trivial. When we define payout flexibility as the ratio of stock repurchases to total payouts, one standard deviation increase in the industry-level union coverage ratio raises a firm's payout flexibility by about 4.0 percent. I also check whether labor unions have actually increased a firm's operating risk and cash flow risk. Empirical results strongly confirm that labor unions significantly increase the degree of a firm's operating leverage and its cash flow uncertainty.

Finally, I investigate whether the strong presence of a labor union affects a firm's capital structure. Previous literature has documented that labor unions affect a firm's leverage. Bronars and Deere (1991) and Matsa (2010) provide evidence that a firm with a strong labor union commits to high leverage to shield resources from union capture. In my paper, I specifically investigate the determinant of a profitable firm's choice between high dividends and high debt when the firm faces a strong labor union. In theory, a firm with a strong labor union should have an incentive to commit to high dividend payouts and/or high leverage in order to protect resources from a labor union. A natural question is whether a profitable firm with a strong union uses high dividends and high leverage as substitutes or not. Relatedly, if they are substitutes, what firms choose high dividends and what firms choose high leverage in order to shield resources from union capture?

My empirical results suggest that a firm's cash flow risk distinguishes between firms that commit to high dividends and those that commit to high leverage. More precisely, a firm's cash flow risk determines the choice of a profitable firm with a strong union between high dividends and high leverage. A highly profitable firm with a strong union chooses high dividends if the firm has low cash flow risk. However, the firm chooses high leverage if it has high cash flow risk.

These findings appear to be consistent with the theory of strategic debt in Bronars and Deere (1991). They argue that a firm's risk of bankruptcy can be a threat to unionized labor. When a firm files with a federal bankruptcy court for protection under Chapter 11, labor union contracts may be voided if canceling them would be financially favorable to the firm and its creditors. If a firm's bankruptcy is sufficiently costly for a unionized labor force, a labor union should soften its demand for wages to avoid bankruptcy. This strategic benefit is particularly relevant to a high cash flow risk firm which faces a high probability of bankruptcy. A low cash flow risk firm has a low probability of bankruptcy, implying low strategic benefit of debt. This type of firm could instead choose high dividends to shield resources from union capture. Overall, a firm's high profitability induces the firm with a strong union to use high dividends or high leverage in order to shield resources from union capture. However, the choice between high dividends and high leverage depends on the firm's cash flow risk.

My study contributes to the literature in two ways. First, this is the first empirical study which documents a firm's strategic commitment to high dividend payouts in order to shield resources from union capture. Previous literature documented an insignificant or modestly negative relationship between labor unions and a firm's dividend payouts because it failed to take into account a non-monotonic relationship between labor unions and dividend payouts. My paper distinguishes between multiple effects of labor unions on a firm's payout policy. A firm with a strong labor union takes into account a trade-off between hedging operating risk and mitigating rent extraction from labor unions when the firm determines its level of dividend payouts. By conditioning on a firm's profitability, I am able to identify a firm's incentive to raise its committed payouts to shield resources from union capture. My empirical results show that the incentive to protect resources from unions significantly influences a firm's payout policy, and a marginal effect of this incentive is shown to be non-trivial. I also document that a firm's incentive to protect resources from labor unions generates a novel interaction between optimal dividend and leverage decisions.

Second, my study increases our understanding of the effects of non-financial stakeholders on a firm's payout policy. While previous literature documented that a firm's cash flow risk affects its dividend policy or stock repurchases, I explore a real determinant of a firm's cash flow risk and

its effect on a firm's payout policy.<sup>20</sup> More precisely, labor unions seem to significantly increase a firm's operating risk and thus motivate a firm to hedge its operating risk through flexible payout policy. By documenting a positive association between labor unions and a firm's payout flexibility through the lens of operating risk, I shed new light on the relationship between a firm's incentive to manage operating risk and its payout policy.

Overall, these results indicate that the strength of a labor union is an important determinant of a firm's payout policy. The organization of this paper is as follows. The next section constructs two hypotheses on payout policy. Section 2.3 presents proxy variables and descriptive statistics. Section 2.4 conducts an empirical analysis and presents the results. Section 2.5 concludes the paper.

## 2.2 Hypothesis construction

Adverse effects of labor unions on a firm's operational flexibility have been well documented in economics literature. A recent article by Chen et al (2010) also suggests that a loss of operational flexibility caused by labor unions could increase a firm's operational risk. For instance, labor unions tend to make layoffs more costly and thus make exchanging fixed costs for variable costs more difficult. This lack of operational flexibility caused by labor unions would increase a firm's operating leverage and cash flow sensitivity to its industry demand. Operating leverage derived from labor unions would increase correlation between a firm's sales revenue and its cash flow. This operational or cash flow risk would be greater when the firm faces higher revenue or demand uncertainty.<sup>21</sup>

Given high operating and cash flow risk originating from labor unions, a firm with a strong

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<sup>20</sup> Rosett (2003) documents that a firm's labor expenses and total employment are positively associated with a firm's equity risk and negatively associated with a firm's dividend yield. My paper examines the relationship between the strength of a labor union and a firm's payout policy including stock repurchases.

<sup>21</sup> Assuming that a firm's cost structure is non-stochastic.

labor union would like to pay low dividends for at least two reasons. First, a manager of the firm would like to set a low level of dividend payouts in order to decrease the possibility of cutting a dividend in the future. Prior literature on dividend policy suggests that cutting or omitting a dividend is very costly and has negative impact on firm value.<sup>22</sup> Second, a firm with high cash flow risk would like to accumulate precautionary savings for profitable investment opportunities by decreasing dividend payouts to shareholders. In any case, all else equal, I expect that one effect of a strong labor union on firm policy is that the firm would pay low dividends due to high operating risk derived from the union.

However, a firm with a strong labor union would not necessarily like to reduce its payouts to accumulate internal funds, since an increase in internal funds might be captured by a labor union through collective bargaining (Klasa et al (2009)). In other words, it would be costly for a firm with a strong labor union to hoard internal funds by decreasing committed payouts. The precautionary motive of increasing internal funds would be mitigated by the presence of a labor union's desire to extract a part of a firm's internal funds. This might be a reason why previous literature did not find a significant relationship between labor unions and dividend payouts. It is possible that the insignificant relation between labor unions and dividend payouts found in previous literature results from these two effects (i.e., operating leverage vs. union rent extraction) offsetting each other.

Thus a firm with a strong labor union faces a trade-off between the cost and the benefit of committing to high dividend payouts. More precisely, labor unions increase both the marginal cost and the marginal benefit of paying an additional dollar of a dividend. On one hand, since a labor union increases a firm's cash flow risk, a firm with a strong union would have a high risk of dividend omission and/or that of losing a valuable investment opportunity in future. Since these are costly for the firm, a labor union effectively increases a firm's marginal cost of paying an additional dollar of a dividend. On the other hand, a firm with a strong labor union would have a high incentive to commit to high dividend payouts in order to protect resources from union capture. In other words, a labor union also increases a firm's marginal benefit of paying an

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<sup>22</sup> See Healy and Palepu (1988), and Michaely, Thaler and Womack (1995), among others.

additional dollar of a dividend. Since a labor union could increase both the marginal cost and the marginal benefit of an additional dollar of a dividend, the *net* marginal benefit could be small so that we may not observe any effect of a labor union on dividend payouts in equilibrium. In general, the relationship between a labor union and a firm's dividend payouts could be positive or negative, depending on magnitudes of increases in the firm's marginal benefit and marginal cost originating from the strength of a labor union. Some firms would increase dividend payouts when they face strong labor unions while other firms choose to reduce dividend payouts.

In this paper, I suggest a way to separately identify the two distinct effects of labor unions on a firm's payout policy. My identification strategy rests on an idea that a labor union should increase a firm's marginal benefit of paying an additional dollar of a dividend only if the firm's profitability is high, since dividends enable the firm to shield resources from union capture. In this case, while it is costly for a firm to commit to a high level of dividend payouts, the benefit of protecting a firm's resources from union capture is likely to be higher than the cost of dividend omission and/or losing an investment opportunity. Thus a firm with a stronger labor union could commit to higher dividends if the firm's profitability is high.

However, if a firm's profitability is low, there would be few internal resources to protect from union capture, so that a firm's marginal benefit of paying an additional dollar of a dividend is likely to be small. A labor union should not much affect the marginal benefit if a firm's profitability is low. In this case, a firm's incentive to mitigate operating risk is likely to be greater than that to shield resources from union capture so that a firm with a stronger labor union would pay lower dividends. Thus, if a labor union increases the marginal cost of paying an additional dollar of a dividend in similar magnitudes for all firms, whether a firm with a stronger labor union pays higher or lower dividends would depend on the firm's profitability (H1: Trade-off hypothesis on dividend payouts).

#### Hypothesis 1: Trade-off hypothesis on dividend payouts

Assuming that a labor union increases the marginal cost of paying an additional dollar of a dividend in similar magnitudes for all firms,

- (i) if a firm's profitability is low, a firm with a stronger labor union would pay lower

dividends since the firm's marginal benefit from protecting resources from union capture would be small.

- (ii) If a firm is highly profitable, a firm with a stronger labor union could commit to higher dividend payouts since the firm's marginal benefit from protecting resources from union capture would be large.

Next, I examine the effect of operating risk originating from labor unions on a firm's composition of payouts (i.e., dividend vs. repurchases). As labor unions could increase a firm's operational and cash flow uncertainty, the firm's commitment to stable dividend payouts would lower managerial flexibility. Jagannathan et al (2000), Guay and Harford (2000) and Skinner (2008) among others provide evidence that a firm with higher cash flow risk tends to use stock repurchases more frequently to preserve financial flexibility than a firm with low cash flow risk. Thus, a firm with high operational and cash flow risk could substitute stock repurchases for dividends to preserve financial flexibility (Grullon and Michaely (2002)).

While a firm's operational risk originating from labor unions should affect its composition of total payouts, it is not clear whether a profitable firm's desire to shield resources from a labor union affects the composition of payouts. A firm with a strong labor union would commit to high dividend payouts, but the firm could also make a high amount of stock repurchases due to its high profit and high cash flow variance (i.e., potential of high excess cash flow) derived from a labor union. A profitable firm with a strong labor union could increase both dividend payouts and stock repurchases together, so that the firm's payout composition might not change with its profitability. Thus, I conjecture that a firm with a strong labor union, regardless of its profitability, would primarily choose high payout flexibility by making a relatively high share of its cash distributions through repurchases (H2: Operating flexibility hypothesis on payout mix).

### Hypothesis 2: Operating flexibility hypothesis on payout mix

A firm with a stronger labor union would choose a more flexible payout policy. The ratio of repurchases to total payouts (i.e., repurchases / (dividends + repurchases)) should be higher for a firm with a stronger labor union.

## 2.3 Data

### 2.3.1 Sample Selection

I use the CRSP/Compustat Merged Database (Fundamental Annual) as the base sample for the period 1983-2009. My procedure for sample screening and variables construction closely follows Fama and French (2001) with some minor modifications. I include only companies with ordinary shares (CRSP share codes 10 or 11). The Compustat SIC codes are used to identify the four-digit SIC code for each firm-year observation, and I include all public companies except those in the financial (SIC 6000-6999) and utilities industries (SIC 4900-4999). The final sample is an unbalanced panel comprising 62,979 firm-year observations from 10,536 firms.

### 2.3.2 Variable Definitions

#### 2.3.2.1 The measure of industry-level labor union coverage

Following Klasa et al (2009) and Chen et al (2010), I use industry-level union coverage data which is available at [www.unionstats.com](http://www.unionstats.com), maintained by Prof. Barry Hirsch and Prof. David Macpherson. The data are compiled from the Current Population Survey based on a method from the Bureau of Labor Statistics. The database reports industry unionization rates for three-digit Census Industry Classification (CIC) industries. These rates represent the percentage of total workers in a CIC industry that are covered by unions in collective bargaining agreements. I use these unionization rates, *Union*, as the measure of the strength of a labor union in each three-digit CIC industry.

#### 2.3.2.2 Measures of corporate payouts

Following Chay and Suh (2009) among others, I use,  $Div/S$ , the common dividends divided by sales as a primary measure of dividend payouts for any year  $t$ . I also use two alternative measures of dividend payouts,  $Div/TA$ , the common dividends divided by total assets, and  $Div/E$ , the common dividends divided by operating income before depreciation. I choose  $Div/S$  as a primary

measure of dividend payouts rather than  $Div/E$ , which is the more traditional measure of dividend payouts, because I will examine whether a firm's profitability affects the relationship between the strength of a labor union and a firm's dividend or payout policy. Since profitability directly affects the denominator of the more traditional dividend measure,  $Div/E$ , using this measure as a dependent variable and including a measure of profitability in a set of dependent variables could bias my estimation results. Nevertheless, I will conduct the same set of regression analysis for three measures of dividend payouts to check whether my results are sensitive to a particular choice of a dividend measure.

As for the measure of flexibility of a firm's payout policy at time  $t$ , following Skinner (2008) and Bonaime, Hankins, and Harford (2011), I use  $Mix$ , the ratio of net share repurchases divided by the sum of dividend payouts and net share repurchases at any time  $t$ .<sup>23</sup> A higher (lower) value of this measure implies a higher (lower) share of distribution through repurchases and higher (lower) payout flexibility. If the total payouts at time  $t$  are zero, the ratio at time  $t$  is treated as missing.

Definitions of all payout measures used in the empirical analysis are listed in the Appendix B. Compustat item names are provided in parentheses. All variables are winsorized at 1 and 99 percentile to avoid the impact of extreme values.

### 2.3.2.3 Firm characteristics

In order to examine the association between labor unions and payout policy, I include the following variables in regressions of dividend payouts to control for other determinants of a firm's dividend policy. Fama and French (2001) identify firm size, profitability, and growth opportunities as important determinants of a firm's propensity to pay a dividend. DeAngelo, DeAngelo, and Stulz (2006) show the ratio of retained earnings over total assets is an important determinant of the propensity to pay a dividend as a measure of a firm's life cycle stage. When I

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<sup>23</sup> I also constructed an alternative measure of payout flexibility, which is defined as the sum of net repurchases in the most recent 3 years dividend by the sum of total payouts in the most recent 3 years. Subsequent empirical analysis using this alternative measure yields qualitatively similar results (and thus are not reported).

examine the relationship between labor unions and a composition of a firm's payout policy including stock repurchases, following Bonaime et al (2011) among others, I include cash holdings, lagged stock return, and total payouts divided by total assets as additional control variables. Definitions of all financial control variables used in the empirical analysis on payout policy are listed in the Appendix B.

Table 11 shows summary statistics of union coverage, measures of dividend payouts and payout flexibility, and firm-level characteristics for regression analysis of corporate payouts.

## 2.4 Empirical analysis

### 2.4.1 Labor unions and a firm's operating and cash flow risk

In my hypothesis construction, I argued that labor unions should significantly increase a firm's operating and cash flow risk. In order to confirm this conjectured relationship in my sample, I perform regression analysis to examine economic impacts of labor unions on a firm's operating risk and cash flow risk respectively.

I use two measures of a firm's operating and cash flow risk. My first measure is a firm's operating risk by the degree of operating leverage (*DOL*) as in Mandelker and Rhee (1984). The degree of operating leverage (*DOL*) is defined as the elasticity of a firm's operating income after depreciation with respect to its sales in the most recent 10 years.<sup>24</sup> A higher *DOL* generally implies higher operating leverage and lower operating flexibility. Chen et al (2010) examined the relationship between labor unions and *DOL* using the 15 most recent quarterly observations during 1984-2006 and found significantly positive association between them. I use yearly observations with a slightly longer sample period to check the robustness of their finding. My second measure is a firm's cash flow risk (*CFVOL*) that is the standard deviation of a firm's cash

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<sup>24</sup> The *DOL* is the coefficient of a univariate regression of the natural log of earnings on the natural log of sales in the most recent 10 yearly observations. See Chen et al (2010) for details of the calculation of the *DOL* when a regression includes some observations with negative earnings.

flow, or ROA, in the most recent 10 years. I define a firm's cash flow as operating income before depreciation divided by total assets (i.e., ROA).

I estimate the following equation (1) for operating risk and cash flow risk:

$$RISK_{i,j,t} = \beta_R * Union_{j,t} + \gamma_R * Financial\ Controls_{i,j,t} + industry\ dummies + year\ dummies \quad (1)$$

Table 12 provides regression results to examine the association between a firm's operating and cash flow risk and labor unions. All models include three-digit CIC industry fixed effects and year dummies.

In models (a) and (b), the dependent variable is the degree of operating leverage, (i.e.,  $RISK = DOL$ ), defined as the elasticity of earnings with respect to sales. The model (a) examines the effect of the strength of a labor union on  $DOL$  without financial controls, while the model (b) includes control variables. In both models, the strength of a labor union significantly increases a firm's degree of operating leverage. Signs of  $\beta_R$  in both models are positive and significant at the 1% level. This evidence is consistent with the conjecture that labor unions increase a firm's operating risk by making a firm's cost structure less flexible.

Besides statistical significance, the economic impact of labor unions on a firm's operating risk is also non-trivial. I compare the degree of operating leverage (i.e., an elasticity of a firm's operating income with respect to a 1% change in its sales) in a highly unionized industry with that in a moderately unionized industry. If a firm operates in an industry where its unionization rate of workers,  $Union$ , is low (e.g., at the 10th percentile value of an empirical distribution of unionization rates), a one percent decline in a firm's sales revenue causes only a 0.12 percent decrease in its operating income after depreciation, when other financial characteristics are held constant at sample median values. Thus a firm's stream of earnings is fairly stable regardless of fluctuations in a firm's sales revenue.

However, if a firm operates in an industry where its unionization rate of workers is high (e.g., at the 90th percentile value of an empirical distribution of unionization rates), a one percent decline in a firm's sales revenue causes a 0.59 percent decrease in its operating income. The later figure is five times larger than the former figure, suggesting that labor unions impose significant operational rigidity on a firm's cost structure.

Models (c) and (d) examine whether the strength of a labor union increases a firm's cash flow uncertainty. The dependent variable in these models is a firm's cash flow volatility in the most recent 10 years (i.e.,  $RISK = CFVOL$ ). The model (c) examines unconditional association between a firm's cash flow risk and *Union*, while the model (d) controls for a firm's financial characteristics. Consistent with the conjecture that labor unions increase a firm's operating and cash flow risk, signs of  $\beta_R$  are positive in both models and they are statistically significant at the 1%. Labor unions significantly increase a firm's cash flow uncertainty. The results in Table 12 validate our conjecture that labor unions impose significant rigidity on a firm's operation, leading to high operating and cash flow risk for a firm with a strong labor union.

## 2.4.2 Labor unions and dividend policy

### 2.4.2.1 Main findings

In this section, I conduct empirical analysis to examine whether labor unions affect a firm's dividend policy. The sample covers the period during 1983-2009 and includes all public firms except those in financial and utilities industries. I perform OLS regressions to examine the relationship between a firm's dividend policy and industry-level union coverage. A unit of observation is at firm ( $i$ ), industry ( $j$ ), and year ( $t$ ). Empirical analysis in this section uses  $Div/S$ , dividend payouts divided by sales, as a primary measure of dividend payouts, and I will use alternative measures of dividend payouts to check robustness of results in the next section.

The strength of a labor union in each industry, *Union*, is defined as the percentage of total workers in each three-digit CIC (i.e., Census Industry Classification) industry that are covered by

unions in collective bargaining agreements. A firm's profitability is measured by *ROA*, operating income divided by total assets. Other financial controls included for regressions on dividend payouts are size, investment opportunities, and life-cycle. Year fixed effects are included in all regressions. Three-digit CIC industry fixed effects are also included to control for unobservable (time-invariant) industry characteristics in all specifications. Standard errors are adjusted for within-firm correlation of error terms.

The baseline estimation model with a primary measure of dividend payouts, *Div/S*, is specified as follows.

$$\begin{aligned} Div / S_{i,j,t} = & \beta_{D1} * Union_{j,t} + \beta_{D2} * ROA_{i,j,t} + \beta_{D3} * Union_{j,t} * ROA_{i,j,t} \\ & + \gamma_D * Financial\ Controls\ (except\ ROA)_{i,j,t} \\ & + industry\ dummies + year\ dummies \end{aligned} \quad (2)$$

The Trade-off hypothesis (H1) predicts that, when a firm's profitability is moderate, a firm with a strong labor union would pay low dividends due to high operating risk originating from a labor union. Thus I expect that a sign of  $\beta_{D1}$  is negative. The Trade-off hypothesis also predicts that, when a firm is highly profitable, a firm with a strong labor union would commit to high dividend payouts in order to shield resources from union capture. Thus I include *Union\*ROA*, the interaction term between the union coverage ratio and a firm's profitability, to examine whether the relationship between labor unions and a firm's dividend payouts depends on its profitability. The hypothesis predicts that the sign of  $\beta_{D3}$  is positive, as a profitable firm with a strong labor union would like to commit to high dividend payouts to shelter resources from a labor union. Thus, the predicted signs of coefficients from the Trade-off hypothesis are:  $\beta_{D1} < 0$  and  $\beta_{D3} > 0$ .

- $\beta_{D1} < 0$  and  $\beta_{D3} > 0$  (H1: The Trade-off hypothesis)

Table 13 shows empirical results of OLS regressions of equation (2). This is similar to regressions run by Matsa (2006). The model (a) estimates equation (2) without the interaction term, *Union\*ROA*, or financial control variables. The model (b) runs a regression of equation (2)

without the interaction term. In both models, consistent with previous literature, the effect of labor unions on a firm's dividend payouts appears weak, as  $\beta_{D1}$  is not statistically significant in each model. However, an inclusion of the interaction term,  $Union*ROA$ , in models (c) and (d) significantly alters estimation results. The model (c) estimates equation (2) without financial controls and the model (d) estimates the full model. In models (c) and (d),  $\beta_{D1}$  is significantly negative and  $\beta_{D3}$  is significantly positive in both models. Both are significant at the 1% level. The model (e) estimates the same specification of model (d) by Tobit regression in which the dependent variable is censored at zero. Main qualitative results are unchanged, and two coefficients,  $\beta_{D1}$  and  $\beta_{D3}$ , are again statistically significant at the 1% level.<sup>25</sup> These results are strongly consistent with the Trade-off hypothesis. While a firm with a strong labor union pays low dividends in order to retain operating flexibility, the firm commits to high dividend payouts to shield resources from union capture if the firm is highly profitable.

The results are not only statistically significant but also economically important. With estimated coefficients in the model (d) in Table 13, one standard deviation increase in the industry-level union coverage ratio from its median value decreases a firm's dividend payouts by 8.7 percent when a firm is at the 25<sup>th</sup> percentile value of profitability and all other financial characteristics are held constant at sample median values. However, the same size of an increase in the union coverage ratio *raises* a firm's dividend payouts by 11.0 percent if the firm is at the 95<sup>th</sup> percentile value of profitability (i.e., if the firm is highly profitable).

Figure 3 illustrates how the sensitivity of a firm's dividend payouts to *Union* changes with its profitability. I calculate the sensitivity by simply partially differentiating equation (2) with respect to *Union*, (i.e.,  $Sensitivity = \beta_{D1} + \beta_{D3} * ROA$ ), using the estimated coefficients in model (d). The figure shows that, if a firm's profitability (*ROA*) is below the 60<sup>th</sup> percentile value of its empirical distribution, a firm with a strong labor union would pay low dividends due to high

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<sup>25</sup> I also estimated the model (d) using a small sample of firm-level union data in 1977 and 1987, obtained from Prof. Barry Hirsch at Georgia State University. Estimation results (not reported here) were broadly consistent with the Trade-off hypothesis though the two coefficients were not statistically significant, possibly due to small sample size which is about 700 firm-year observations.

operating risk originating from a labor union. However, if a firm's profitability is above the 60<sup>th</sup> percentile value, a firm with a stronger labor union would commit to higher dividend payouts in order to shield resources from union capture. The sensitivity is highly dependent on a firm's profitability.

These results highlight the importance of separately identifying two distinct effects of labor unions on a firm's dividend policy. In contrast to previous findings, my results show significant effects of labor unions on a firm's dividend policy once heterogeneous effects of profitability on the relationship between labor unions and dividend payouts are taken into consideration.

#### 2.4.2.2 Alternative measures of a firm's dividend payouts

In this section, I replicate OLS regressions with two alternative measures of a firm's dividend payouts to investigate whether the results in Table 13 are sensitive to different measures of dividend payouts. These two measures are:  $Div/TA$ , dividend divided by total assets, and  $Div/E$ , dividend divided by operating income before depreciation. For calculation of  $Div/E$ , when the denominator is negative,  $Div/E$  is treated as missing. Both measures are winsorized at 1 and 99 percentile to avoid the impact of extreme values.

Models (a) and (b) in Table 14 provide estimation results using  $Div/TA$  as a dependent variable. Consistent with two hypotheses, signs of  $\beta_{D1}$  are negative while those of  $\beta_{D3}$  are positive. They are all statistically significant at the 1% level, providing further support for the conjecture that an optimal payout policy of a firm with a strong labor union depends on the firm's profitability. Models (c) and (d) use  $Div/E$ , a traditional measure of dividends, as a dependent variable. As I have explained in a previous section, since our variable of interest,  $Union*ROA$ , directly affects the denominator of the dependent variable, estimated coefficients may be biased due to simultaneity between  $Div/E$  and  $ROA$ . Nevertheless, signs of  $\beta_{D1}$  and  $\beta_{D3}$  in models (c) and (d) are consistent with the Trade-off hypothesis and they are mostly significant.

Overall, signs and statistical significance of  $\beta_{D1}$  and  $\beta_{D3}$  with alternative measures of dividend

payouts in Table 14 are similar to those in Table 13, providing further support for the Trade-off hypothesis.

#### 2.4.2.3 Alternative measure of a firm's profitability

While I use *ROA*, operating income divided by total assets, as a measure of a firm's profitability, one concern of using this measure in our context is that the strength of a labor union could directly affect a firm's profitability. Hirsch (1991a, 1991b, 2007) among others documented that labor unions negatively affect a firm's profitability, although economic impacts of labor unions on profitability are rather controversial. If one believes that economic impacts of labor unions on a firm's profitability are non-trivial, the interpretation of the interaction term between *Union* and *ROA* as the measure of strategic commitment may be questionable.

To address this concern, I construct an alternative measure of profitability, *ROA\_L*, which adds back a firm's labor expenses to operating income in order to mitigate an impact of labor unions on a firm's profitability. However, a drawback of this approach is that the number of observations with labor expenses is so small that our sample size decreases by almost 90 percent.

I now replicate the model (d) in Table 13 with the alternative measure of profitability, *ROA\_L* in Table 15. Dependent variables in models (a), (b), and (c) in Table 15 are *Div/S*, *Div/TA*, and *Div/E*, respectively. As most of firms in sample do not report their labor expenses, our sample size for the empirical analysis in this section drops significantly and thus decreases overall statistical power.

In fact, coefficients of *Union* are insignificant in all models as time-series variation of *Union* is relatively small. Given a small sample size and three-digit CIC industry-level fixed effects, it is difficult to precisely identify the direct effect of *Union* on a firm's dividend payouts. Besides, firms that report labor expenses tend to be significantly larger than other firms.<sup>26</sup> Since large firms tend to be financially unconstrained, the effects of operating risk originated from unions on

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<sup>26</sup> Median asset size of firms that report labor expenses is five times larger than the sample median value.

these firms would be small. Nevertheless, signs of  $\beta_{D1}$  in models (b) and (c) are consistent with the Trade-off hypothesis although they are far from statistically significant. In contrast, signs of  $\beta_{D3}$  are positive in all models and  $\beta_{D3}$  is significant at the 5% level in models (a) and (b).

In sum, although statistical significance of variables of interest decline as the sample size decreases significantly, qualitative results are broadly consistent with the implication from the Trade-off hypothesis that a firm with a strong labor union chooses its optimal payout policy, depending on the firm's profitability.

#### 2.4.2.4 Sub-sample analysis

In this section, I examine whether our empirical results are stable over time. As Figure 4 shows, the strength of labor unions has been generally declining since 1983. One might naturally ask whether economic impacts of labor unions are still present and important. If a decline in unionized labor force implies smaller effects of labor unions on a firm's operating risk or its desire to shield resources from union capture than before, we might expect that statistical and economic significances of variables of our interest are smaller during more recent years in our sample period. In order to examine this possibility, I replicate OLS regressions of models (c) and (d) in Table 13 for the period 1983-1995 and for the period 1996-2009 separately.

However, estimation results in Table 16 suggest that the effects of labor unions on a firm's payout policy are still strong in the later period. Signs of  $\beta_{D1}$  and  $\beta_{D3}$  are consistent with the Trade-off hypothesis and they are all significant at the 1% level in the later period. In spite of decreasing unionization rates in labor markets over the last 30 years, my results indicate that labor unions still have significant impacts on a firm's payout policy, if a firm faces a highly unionized labor force.

#### 2.4.3 Labor unions and payout mix

While I have examined the effects of labor unions on a firm's dividend policy, I have not yet

included another important form of cash distribution to shareholders. Firms have been increasingly replacing dividend payouts with stock repurchases as a method of paying out cash to shareholders. In particular, previous literature has documented that a firm with high cash flow risk tends to use stock repurchases more frequently than a firm with low cash flow risk, as stock repurchase is a more flexible method of distribution than dividend payouts (Jagannathan et al (2000), Guay and Harford (2000)). If labor unions increase a firm's operating and cash flow risk, I would conjecture that a firm with a stronger labor union should pay a relatively higher share of distributions through stock repurchases (i.e., Operating flexibility hypothesis on payout mix (H2)).

I estimate equation (3) to test the Operating flexibility hypothesis on payout mix (H2).

$$\begin{aligned} Mix_{i,j,t} = & \beta_{M1} * Union_{j,t} + \beta_{M2} * ROA_{i,j,t} + \beta_{M3} * Union_{j,t} * ROA_{i,j,t} \\ & + \gamma_M * Financial\ Controls\ (except\ ROA)_{i,j,t} \\ & + industry\ dummies + year\ dummies \end{aligned} \quad (3)$$

where

$$Mix_{i,j,t} \equiv Rep_{i,j,t} / (Div_{i,j,t} + Rep_{i,j,t}) .$$

*Mix* is the ratio of net share repurchases divided by the sum of dividend payouts and net share repurchases and it is treated as missing when the denominator is zero. Following prior literature, financial controls include a firm's cash holdings, total payouts, and average monthly stock return in a previous year, in addition to those used in equation (2).

The Operating flexibility hypothesis predicts that a firm with a stronger labor union would tend to make a relatively higher share of distributions through stock repurchases rather than dividend payouts. Thus the predicted sign of  $\beta_{M1}$  is positive. With respect to the sign of  $\beta_{M3}$ , its predicted sign is ambiguous. While a firm with a strong union would commit to high dividend payouts to protect resources from union capture, the firm could also distribute a high amount of stock repurchases due to its high profit and high cash flow variance (i.e., potential of high excess cash flow) derived from a labor union. As a firm with a strong union could make both high dividend

payouts and high stock repurchases, the hypothesis does not predict the sign of  $\beta_{M3}$ . Finally, The predicted sign of  $\beta_{M2}$  is also ambiguous as there is no theory clearly predicting the effect of a firm's profitability on its payout mix. Thus the implication from the Operating flexibility hypothesis on payout mix (H2) is that the sign of  $\beta_{M1}$  should be positive.

- $\beta_{M1} > 0$  (H2: The Operating flexibility hypothesis on payout mix)

Table 17 provides estimation results. Consistent with the Operating flexibility hypothesis, the coefficient  $\beta_{M1}$  is positive in all models, indicating that a firm with a strong labor union makes a higher share of distributions through stock repurchases. The coefficient is significant at the 1% level in models (a) and (b).

In model (c), the coefficient  $\beta_{M1}$  is positive but it is far from significant. However, the coefficient becomes significant at the 1% level in model (d) when other determinants of payout flexibility are included, suggesting the predicted relationship between labor unions and payouts composition is fairly robust.

The Operating flexibility hypothesis does not predict an unambiguous sign of  $\beta_{M3}$ , as a firm with a strong labor union could increase both dividend and stock repurchases. While the coefficient  $\beta_{M3}$  in model (c) is statistically significant, it becomes insignificant in model (d) which estimates the full model with all financial controls.

The marginal effect of the strength of a labor union on payout flexibility is also non-trivial. With estimated coefficients in model (d) in Table 17, one standard deviation increase in the industry-level union coverage ratio from its median value raises a firm's payout flexibility by about 4.0 percent when the firm's profitability and all other financial controls are held constant at sample median values. Overall, a firm with a strong labor union seems to increase its payout flexibility by actively substituting stock repurchases for dividend in order to hedge high operating risk originating from a labor union.

#### 2.4.4 Labor unions, leverage, and payout policy

Up to this point, I have examined whether labor unions affect a firm's payout policy. In this last section, I investigate the relationship between labor unions and a firm's financing policy. Previous literature has documented a positive association between labor unions and leverage. For instance, Bronars and Deere (1991) find a positive relation between industry-level union coverage and industry-level leverage for the year 1973. Matsa (2010) also finds a positive relation between leverage and firm-level unionization data for a small sample of manufacturing firms with the sample of three years in 1977, 1987, and 1999.

A natural question is whether a profitable firm with a strong labor union commits to high leverage to shield resources from union capture. In our context, debt repayments and dividend payouts are similar in a sense that they are committed payouts to stakeholders. Thus, a profitable firm with a strong union may commit to high dividends and/or high leverage for protecting its internal resources. If high leverage and high dividend payouts are substitutes, what determines the choice of a profitable firm with a strong union between high leverage and high dividends in order to shelter resources from union capture?

My empirical results suggest that a profitable firm with a strong union substitutes between high dividends and high leverage, and the choice between the two depends on a firm's cash flow risk. More precisely, I find that a profitable firm with a strong union commits to high leverage if it has high cash flow risk. However, if the firm has low cash flow risk, it chooses high dividends to shield resources from union capture.

To investigate how a profitable firm with a strong union protects resources from union capture, I estimate the following equation (4) to examine whether a profitable firm with a strong union uses high leverage to shield resources from a labor union.

$$\begin{aligned}
Leverage_{i,j,t} = & \beta_{L1} * Union_{j,t} + \beta_{L2} * ROA_{i,j,t} + \beta_{L3} * Union_{j,t} * ROA_{i,j,t} \\
& + \gamma_L * Financial\ Controls\ (except\ ROA)_{i,j,t} \\
& + industry\ dummies + year\ dummies
\end{aligned} \tag{4}$$

A firm's leverage is defined as book leverage, measured as the sum of short-term and long-term debt, divided by total book assets. In addition, motivated by prior literature, I employ the following financial controls for regression analysis on leverage: *ROA* (profitability), *lnAsset* (size), *MBR* (market to book ratio), *FA/TA* (net property, plant, and equipment over total assets), *RD/Sales* (R&D expenditure over sales), *Dep/TA* (depreciation over total assets), *GE/TA* (general and administrative expenditure over total assets), and *SAVOL* (sales volatility). All models include three-digit CIC industry fixed effects, year dummies, and financial controls. Definitions of all variables are listed in the Appendix B.

The sign of  $\beta_{L3}$  tells us whether a profitable firm with a strong union commits to high leverage in order to shield resources from union capture. With our previous results on dividend payouts, a positive sign of  $\beta_{L3}$  would imply that a profitable firm with a strong union increases leverage *and* dividends to shield resources from union capture. A negative sign would imply that a profitable firm with a strong union primarily uses high dividends to shield resources from union capture.

Models (a) through (c) in Table 18 provide estimation results for regression analysis on leverage. Model (a) estimates equation (4) without the interaction term, *Union\*ROA*, while model (b) includes the interaction term. The result in model (b) shows that the coefficient of the interaction term,  $\beta_{L3}$ , is negative and statistically significant at the 1% level. This result seems to suggest that a profitable firm with a strong union only commits to high dividends, not high leverage, in order to shield resources from union capture.

However, I find evidence that a profitable firm with a strong labor union actually commits to high leverage if the firm has high cash flow risk. More precisely, I estimate the following equation (5) to test whether a profitable firm uses high leverage in order to shield resources from

union capture when the firm has high cash flow risk. I include an additional interaction term,  $Union*ROA*SAVOL$ , to the specification of equation (4).<sup>27</sup>

$$\begin{aligned}
 Leverage_{i,j,t} = & \beta_{L1} * Union_{j,t} + \beta_{L2} * ROA_{i,j,t} + \beta_{L3} * Union_{j,t} * ROA_{i,j,t} \\
 & + \beta_{L4} * Union_{j,t} * ROA_{i,j,t} * SAVOL_{i,j,t} + \beta_{L5} * SAVOL_{i,j,t} \\
 & + \gamma_L * Financial\ Controls\ (except\ ROA,\ SAVOL)_{i,j,t} \\
 & + industry\ dummies + year\ dummies
 \end{aligned} \tag{5}$$

Model (c) reports the estimation result of equation (5). Importantly, a sign of  $\beta_{L4}$  is significantly positive at the 1% level, indicating that a profitable firm with a strong labor union would commit to high leverage if the firm has high cash flow risk. This finding seems to be consistent with previous literature on positive association between leverage and labor unions (e.g., Bronars and Deere (1991) and Matsa (2010)). A firm with a strong labor union has an incentive to increase leverage in order to raise the probability of bankruptcy and thus derive a concession from unionized workers who would suffer from lost wages in the event of bankruptcy. When a firm has higher cash flow volatility, an increase in leverage could be a more credible threat to unionized workers. However, when cash flow risk is low, there would be little strategic benefit for a profitable firm with a strong union to commit to high leverage.

Finally, I provide evidence that a profitable firm with a strong union substitutes high leverage for high dividends to shield resources from union capture when the firm has high cash flow risk. Model (d) in Table 18 estimates the following equation (6) which is similar to equation (5) except that the dependent variable is now dividend payouts and that financial controls are those used in the analysis of dividend payouts in the section 2.4.2.

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<sup>27</sup> I use  $SAVOL$ , a firm's sales volatility, to proxy for a firm's cash flow risk here, since  $Union$  directly affects a firm's cash flow risk in my model.

$$\begin{aligned}
Div / S_{i,j,t} = & \beta_{D1} * Union_{j,t} + \beta_{D2} * ROA_{i,j,t} + \beta_{D3} * Union_{j,t} * ROA_{i,j,t} \\
& + \beta_{D4} * Union_{j,t} * ROA_{i,j,t} * SAVOL_{i,j,t} + \beta_{D5} * SAVOL_{i,j,t} \\
& + \gamma_D * Financial\ Controls\ (except\ ROA,\ SAVOL)_{i,j,t} \\
& + industry\ dummies + year\ dummies
\end{aligned} \tag{6}$$

Given that the coefficient  $\beta_{L4}$  of the interaction term,  $Union*ROA*SAVOL$ , is positive in the leverage regression, if the firm substitutes high leverage for high dividends, the estimated coefficient  $\beta_{D4}$  should be negative in equation (6). The result in the model (d) shows a significantly negative sign of  $\beta_{D4}$ , suggesting that a profitable firm with a strong union substitutes high leverage for high dividends in order to protect internal resources when its cash flow risk is high.

In sum, my results indicate that a profitable firm with a strong labor union commits to high dividends *or* high leverage to shield resources from union capture. The choice between high dividends and high leverage depends on the firm's cash flow risk. Overall, these results uncover a novel interaction between a firm's payout policy and debt policy motivated by the presence of labor unions.

## 2.5 Conclusion

Previous literature documented a weak relationship between labor unions and a firm's payout policy. However, this paper uncovers significant effects of labor unions on a firm's dividend policy and payout flexibility. By explicitly recognizing that unions could affect a firm's dividend policy in two offsetting ways, I find evidence that a firm with a strong labor union tends to pay low dividends and makes a relatively high share of its distributions through repurchases, due to high operating risk originating from labor unions. However, if a firm is highly profitable, the firm with a strong labor union strategically commits to high dividend payouts in order to shield resources from union capture. Previous literature did not distinguish between these two conflicting effects, leading to confusing inferences on the association between labor unions and a

firm's payout policy. Finally, I provide evidence that a firm with a strong labor union substitutes between high dividends and high leverage to shield resources from the union. Overall, my findings suggest that labor unions significantly increase both a firm's operating risk and its exposure to rent extraction from unions, and a firm manages these risks by choosing optimal payout policy based on its profitability.

Table 11: Summary statistics of industry-level union coverage ratio (Union), four payouts measures, and firm characteristics used in empirical analysis on a firm's payout policy

Variable	Mean	Median	Std.Dev	25 <sup>th</sup> percentile	75 <sup>th</sup> percentile	N
<b>Union</b>	.1463198	.099	.1337504	.0470227	.205	62979
<b>Div/S</b>	.0070117	0	.0151557	0	.0071419	61953
<b>Div/TA</b>	.0067896	0	.0129964	0	.0089891	62135
<b>Div/E</b>	.0466373	0	.0881277	0	.0669675	61484
<b>Mix</b>	.5790255	.8042332	.4456135	0	1	30579
<b>ROA</b>	.1025602	.1231605	.1607254	.0487741	.1913903	54515
<b>InAsset</b>	5.180657	5.055009	2.136241	3.596325	6.674256	61557
<b>MBR</b>	1.768427	1.341946	1.241085	1.031028	2.003868	61699
<b>AGR</b>	.1413601	.0661871	.3580887	-.035838	.2089743	61553
<b>RE/TA</b>	-.1225111	.1277534	.9047533	-.1426969	.3188495	61402
<b>Cash/TA</b>	.1531283	.0744614	.1876236	.0228569	.2096702	61058
<b>Stock Return</b>	.0118835	.0100596	.0563597	-.0158147	.0356559	54536
<b>Total/TA</b>	.0140196	.000093	.026233	0	.0174804	57816

Table 12: OLS regressions to examine the effects of industry-level union coverage ratio (Union) on a firm's risk (RISK)

Dep.var = RISK	(a) RISK = DOL	(b) RISK = DOL	(c) RISK = CFVOL	(d) RISK = CFVOL
<b>Union</b>	1.361*** (2.90)	1.426*** (2.79)	0.052*** (4.16)	0.036*** (3.75)
<b>SAVOL</b>		-0.103 (0.52)		0.084*** (18.42)
<b>Leverage</b>		-0.013 (0.06)		-0.021*** (6.61)
<b>FA/TA</b>		-0.188 (0.77)		0.004 (1.12)
<b>ROA</b>		1.541*** (5.13)		-0.050*** (8.35)
<b>InAsset</b>		-0.060*** (2.76)		-0.008*** (23.96)
<b>MBR</b>		-0.057* (1.93)		0.007*** (10.54)
<b>AGR</b>		-0.099 (1.10)		0.017*** (11.21)
<b>RE/TA</b>		0.459*** (7.76)		-0.023*** (16.20)
<b>Constant</b>	0.240 (0.65)	0.294 (0.64)	0.043*** (5.78)	0.066*** (12.34)
<b>Observations</b>	32283	27611	47229	39859
<b>Adjusted R<sup>2</sup></b>	0.020	0.032	0.168	0.433
<b>Robust t statistics in parentheses</b>				
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>				

Table 13: OLS and Tobit regressions to examine the relation between dividend payouts (Div/S) and industry-level union coverage ratio (Union)

Dep.var = Div/S	(a) OLS	(b) OLS	(c) OLS	(d) OLS	(e) Tobit
<b>Union</b>	-0.000 (0.03)	-0.003 (0.95)	-0.011*** (3.67)	-0.013*** (4.64)	-0.032*** (5.48)
<b>ROA</b>		0.011*** (11.65)	0.016*** (8.57)	0.001 (0.89)	0.019*** (4.09)
<b>Union*ROA</b>			0.071*** (7.52)	0.083*** (9.75)	0.074*** (4.29)
<b>InAsset</b>		0.002*** (21.10)		0.002*** (20.96)	0.006*** (27.88)
<b>MBR</b>		0.002*** (11.63)		0.002*** (11.89)	0.001*** (3.91)
<b>AGR</b>		-0.006*** (20.95)		-0.006*** (21.13)	-0.013*** (14.03)
<b>RE/TA</b>		0.002*** (10.70)		0.002*** (12.13)	0.041*** (25.00)
<b>Constant</b>	0.014*** (2.82)	0.002 (0.28)	0.015*** (2.61)	0.002 (0.44)	-0.029*** (3.63)
<b>Observations</b>	61953	50180	53686	50180	50180
<b>Adjusted R<sup>2</sup></b>	0.131	0.291	0.202	0.298	
<b>Robust t statistics in parentheses</b>					
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>					

Table 14: OLS regressions to examine the relation between alternative measures of dividend payouts (Div/TA, Div/E) and industry-level union coverage ratio (Union)

Dep.var	(a) Div/TA	(b) Div/TA	(c) Div/E	(d) Div/E
<b>Union</b>	-0.010*** (4.37)	-0.012*** (5.66)	-0.027* (1.76)	-0.046*** (2.97)
<b>ROA</b>	0.016*** (10.09)	0.004*** (3.42)	0.093*** (10.51)	-0.000 (0.06)
<b>Union*ROA</b>	0.063*** (8.17)	0.073*** (10.37)	0.144*** (3.17)	0.192*** (4.67)
<b>InAsset</b>		0.002*** (19.42)		0.014*** (23.94)
<b>MBR</b>		0.002*** (14.37)		0.007*** (10.04)
<b>AGR</b>		-0.006*** (25.06)		-0.030*** (21.45)
<b>RE/TA</b>		0.002*** (12.83)		0.015*** (14.00)
<b>Constant</b>	0.011*** (3.91)	0.000 (0.13)	0.074*** (4.18)	0.010 (0.53)
<b>Observations</b>	53814	50285	53282	49777
<b>Adjusted R<sup>2</sup></b>	0.207	0.302	0.159	0.253
<b>Robust t statistics in parentheses</b>				
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>				

Table 15: OLS regressions to examine the relation between three measures of dividend payouts (Div/S, Div/TA, Div/E) and industry-level union coverage ratio (Union) with an alternative measure of profitability (ROA\_L)

Dep.var	(a) Div/S	(b) Div/TA	(3) Div/E
<b>Union</b>	0.003 (0.23)	-0.010 (1.26)	-0.073 (1.46)
<b>ROA_L</b>	0.002 (0.96)	0.006*** (3.53)	0.025** (2.43)
<b>Union*ROA_L</b>	0.024** (2.10)	0.023** (2.27)	0.040 (0.64)
<b>InAsset</b>	0.003*** (10.46)	0.002*** (10.73)	0.017*** (12.10)
<b>MBR</b>	0.003*** (4.87)	0.003*** (6.67)	0.010*** (3.41)
<b>AGR</b>	-0.006*** (6.33)	-0.007*** (10.76)	-0.034*** (8.39)
<b>RE/TA</b>	0.006*** (5.54)	0.005*** (5.98)	0.024*** (5.20)
<b>Constant</b>	0.018* (1.70)	-0.004** (2.18)	0.011 (0.69)
<b>Observations</b>	5396	5428	5443
<b>Adjusted R<sup>2</sup></b>	0.478	0.516	0.432
<b>Robust t statistics in parentheses</b>			
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>			

Table 16: Sub-sample analysis to examine stability of the relation between dividend payouts (Div/S) and industry-level union coverage ratio (Union)

Dep.var = Div/S	(a) 1983-1995	(b) 1983-1995	(c) 1996-2009	(d) 1996-2009
<b>Union</b>	-0.008* (1.83)	-0.007* (1.79)	-0.014*** (3.96)	-0.019*** (5.48)
<b>ROA</b>	0.020*** (8.91)	0.003* (1.65)	0.013*** (5.93)	-0.001 (0.70)
<b>Union*ROA</b>	0.063*** (5.98)	0.070*** (7.18)	0.089*** (6.28)	0.103*** (7.89)
<b>InAsset</b>		0.003*** (20.21)		0.002*** (15.11)
<b>MBR</b>		0.002*** (8.73)		0.002*** (10.12)
<b>AGR</b>		-0.006*** (16.18)		-0.006*** (16.94)
<b>RE/TA</b>		0.003*** (8.72)		0.002*** (10.19)
<b>Constant</b>	0.016*** (2.60)	0.001 (0.13)	0.011** (2.02)	-0.003 (0.53)
<b>Observations</b>	24822	23423	28864	26757
<b>Adjusted R<sup>2</sup></b>	0.223	0.366	0.197	0.259
<b>Robust t statistics in parentheses</b>				
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>				

Table 17: OLS regressions to examine the relation between payout flexibility (Mix) and industry-level union coverage ratio (Union)

Dep.var = Mix	(a)	(b)	(c)	(d)
<b>Union</b>	0.232*** (3.04)	0.277*** (3.20)	0.042 (0.46)	0.294*** (2.94)
<b>ROA</b>		-0.220*** (4.25)	-0.743*** (14.64)	-0.205*** (2.97)
<b>Union*ROA</b>			1.299*** (4.76)	-0.106 (0.37)
<b>InAsset</b>		-0.056*** (16.58)		-0.056*** (16.57)
<b>MBR</b>		-0.040*** (6.18)		-0.040*** (6.21)
<b>AGR</b>		0.063*** (4.70)		0.063*** (4.70)
<b>RE/TA</b>		-0.200*** (12.19)		-0.201*** (12.13)
<b>Cash/TA</b>		0.075** (1.99)		0.076** (2.00)
<b>Stock Return</b>		0.056 (0.71)		0.056 (0.72)
<b>Total/TA</b>		3.685*** (26.26)		3.687*** (26.31)
<b>Constant</b>	0.099 (1.34)	0.406*** (4.82)	0.177** (2.28)	0.403*** (4.78)
<b>Observations</b>	30579	22469	28313	22469
<b>Adjusted R<sup>2</sup></b>	0.168	0.325	0.188	0.325
<b>Robust t statistics in parentheses</b>				
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>				

Table 18: OLS regressions to compare the relation between a firm's debt policy (Leverage) and industry-level union coverage ratio (Union) and that between a firm's dividend payouts (Div/S) and Union

Dep.var	(a) Leverage	(b) Leverage	(c) Leverage	(d) Div/S
<b>Union</b>	-0.110*** (3.80)	-0.058* (1.82)	-0.052 (1.62)	-0.018*** (5.78)
<b>ROA</b>	-0.145*** (13.31)	-0.092*** (5.82)	-0.099*** (6.26)	0.003** (2.06)
<b>Union*ROA</b>		-0.397*** (4.45)	-0.724*** (6.45)	0.139*** (10.99)
<b>Union*ROA*SAVOL</b>			1.348*** (4.94)	-0.252*** (9.30)
<b>InAsset</b>	0.015*** (14.80)	0.015*** (14.73)	0.016*** (15.00)	0.002*** (17.49)
<b>MBR</b>	-0.022*** (15.46)	-0.022*** (15.71)	-0.022*** (15.39)	0.002*** (11.60)
<b>SAVOL</b>	0.075*** (7.55)	0.075*** (7.54)	0.053*** (4.83)	-0.002*** (2.69)
<b>FA/TA</b>	0.148*** (10.36)	0.148*** (10.35)	0.150*** (10.50)	
<b>RD/Sales</b>	-0.051*** (4.82)	-0.043*** (4.11)	-0.048*** (4.50)	
<b>Dep/TA</b>	0.336*** (5.31)	0.341*** (5.40)	0.345*** (5.46)	
<b>GE/TA</b>	-0.103*** (10.69)	-0.101*** (10.46)	-0.099*** (10.22)	
<b>AGR</b>				-0.006*** (17.70)
<b>RE/TA</b>				0.002*** (11.50)
<b>Constant</b>	0.156*** (5.52)	0.151*** (5.29)	0.152*** (5.31)	0.006 (0.84)
<b>Observations</b>	36894	36894	36894	41709
<b>Adjusted R<sup>2</sup></b>	0.246	0.247	0.249	0.315
<b>Robust t statistics in parentheses</b>				
<b>* significant at 10%; ** significant at 5%; *** significant at 1%</b>				

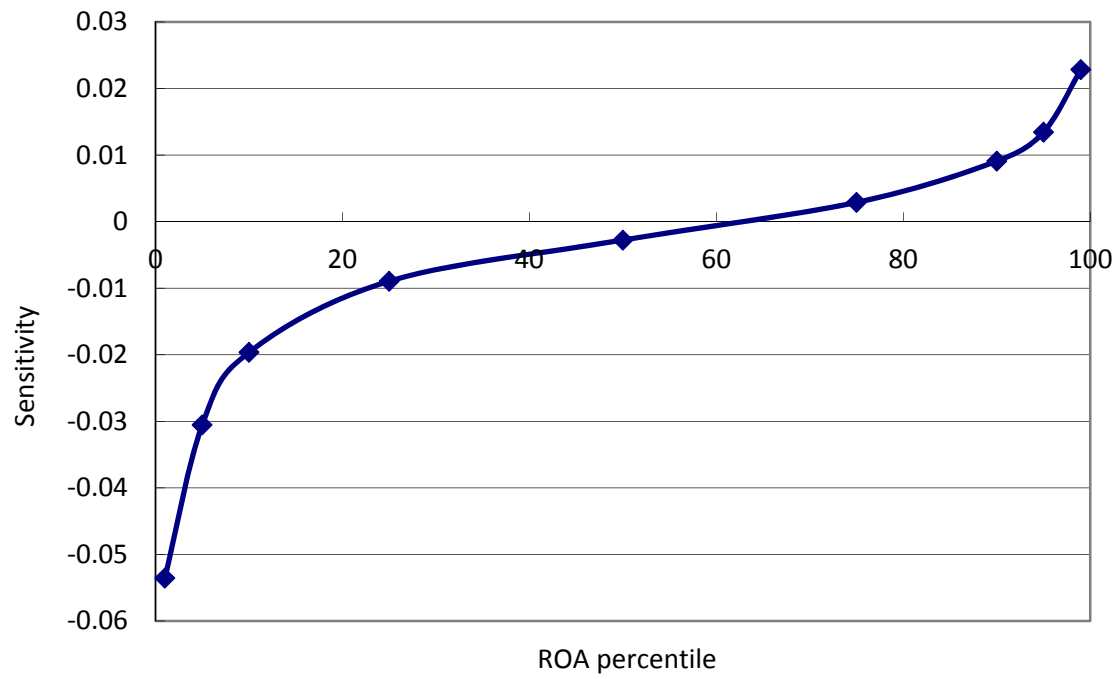


Figure 3: Sensitivity of a firm's dividend payouts with respect to the strength of a labor union, conditional on *ROA* percentile

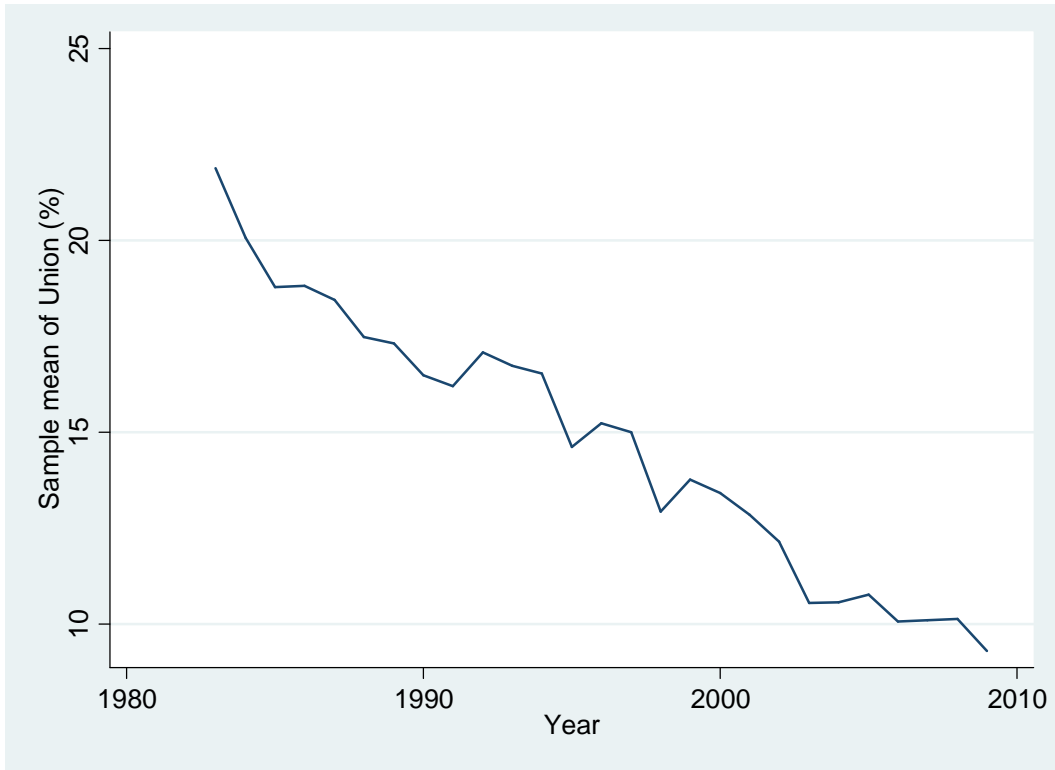


Figure 4: Cross-sectional sample mean of Union (union coverage ratio) across all firms during 1983-2009

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## Appendix A: Variable definitions for Chapter 1

- (i) Detailed definitions corporate payouts and other firm characteristics in Table 1 are listed below. Compustat item names are provided in parenthesis.
- A primary measure of dividend payouts is Div/E, the common dividends (dvc) divided by operating income before depreciation (oibdp). I also use two alternative measures of dividend payouts. These are Div/TA, the common dividends (dvc) divided by total assets (at), and Div/ME, the common dividends (dvc) divided by market equity which is calculated as common shares outstanding (csho) multiplied by the closing share price at the end of a year (prcc).
  - Three measures of total payouts, Total/E, Total/TA, and Total/ME, are defined as the sum of dividend payouts (dvc) and net share repurchases divided by operating income before depreciation, by total assets, and by market equity, respectively. The calculation procedure of net share repurchases follows Fama and French (2001) and Skinner (2008).
  - Firm size is measured by lnAsset, the natural logarithm of a firm's total assets (at). A larger firm is more likely to be financially unconstrained than a small firm.
  - Profitability is measured by the ratio of a firm's earnings before interest and tax to its total assets. It is calculated by (interest expense (xint) + income before extraordinary items (ib) + deferred taxes (txdi if available)) / total assets (at). A firm with higher profitability would have a greater capacity to make dividend payouts.
  - Investment opportunities are measured by two variables: AGR, the firm's one-year growth rate of total assets (at), and MBR, the market-to-book ratio. MBR is computed as (total assets (at) – book equity (ceq) + market equity) / total assets (at), where market equity is stock price (prcc) times shares outstanding (csho)). A firm with greater investment opportunities would be likely to forgo dividend payouts and use these resources to fund investment opportunities.
  - Leverage is measured by Lev, (one-year lagged) book value of total debts (i.e., long-term debt (dltt) plus short-term debt (dd1)) divided by total assets (at).
  - A firm's life-cycle stage is measured by RE/TA, retained earnings (re) divided by total

assets (at).

- (ii) Other firm characteristics in Table 1 include additional control variables used in regression analysis of cash holdings. These include Cash/TA, CF/TA, NWC/TA, CAPEX/TA, RD/Sales, and ACQ/TA.
- Our measure of cash holdings is Cash/TA, cash and short-term investments (che) divided by total assets (at).
  - A firm's cash flow is measured by CF/TA, earning after interest and taxes but before depreciation divided by total assets  $((oibdp - xint - txt) / at)$ . Firms with higher cash flow would accumulate more cash if they are financially constrained.
  - Our measure for net working capital consists of assets that substitute for cash. NWC/TA is net working capital (wcap) minus cash (che), divided by total assets (at).
  - CAPEX/TA measures capital expenditures as the ratio of capital expenditures (capx) to total assets (at).
  - A firm's growth opportunities are measured by RD/Sales, R&D expenditures (xrd) divided by sales (sale). Following Bates et al (2009), R&D is set equal to zero when it is missing in COMPUSTAT.
  - Acquisition activity is measured by ACQ/TA, acquisition (aqc) divided by total assets (at).

## Appendix B: Variable definitions for Chapter 2

- (i) Definitions of all payout measures used in the empirical analysis are listed below. Compustat item names are provided in parenthesis.
- A primary measure of dividend payouts is  $Div/S$ , the common dividends (dvc) divided by sales (sale).
  - Two alternative measures of dividend payouts are,  $Div/TA$ , the common dividends (dvc) divided by total assets (at), and  $Div/E$ , the common dividends (dvc) divided by operating income before depreciation (oibdp). When the denominator of  $Div/E$  is negative,  $Div/E$  is treated as missing.
  - Payout flexibility,  $Mix$ , is defined as net share repurchases divided by the sum of the common dividends and net share repurchases. When the denominator is zero (i.e., when total payouts is zero),  $Mix$  is treated as missing.
- (ii) Definitions of all financial control variables used in the empirical analysis on dividend payouts are listed below.
- Profitability is measured by  $ROA$ , calculated by operating income before depreciation (oibdp) divided by total assets (at). A firm with higher profitability would have a greater capacity to make dividend payouts.
  - Firm size is measured by  $lnAsset$ , the natural logarithm of a firm's total assets (at). A larger firm is more likely to be financially unconstrained than a small firm.
  - Investment opportunities are measured by two variables:  $AGR$ , the firm's one-year growth rate of total assets (at), and  $MBR$ , the market-to-book ratio.  $MBR$  is computed as  $(total\ assets\ (at) - book\ equity\ (ceq) + market\ equity) / total\ assets\ (at)$ , where market equity is stock price (prcc) times shares outstanding (csho)).
  - A firm's life-cycle stage is measured by  $RE/TA$ , retained earnings (re) divided by total assets (at).

- (iii) In addition to variables defined in (ii), I include following variables for empirical analysis on a firm's operating and cash flow risk.
- A firm's sales volatility is measured by *SAVOL*, a standard deviation of the ratio of a firm's sales (*sale*) to total assets (*at*) in the most recent 10 years.
  - Financial leverage is measured by *Leverage*, book value of total debt (i.e., long-term debt (*dltt*) plus short-term debt (*dd1*)) divided by total assets (*at*).
  - Size of a firm's fixed assets is measured by *FA/TA*, net property, plant and equipment (*ppent*) divided by total assets (*at*). A large amount of fixed assets would increase a firm's operating leverage.
- (iv) Regression analysis of a firm's payout composition, or payout flexibility, includes the following independent variables in addition to variables defined in (ii).
- Our measure of cash holdings is *Cash/TA*, cash and short-term investments (*che*) divided by total assets (*at*).
  - A firm's stock return in a previous year, *Stock Return*, is calculated by an average of monthly stock returns in a previous year from the CRSP database.
  - Total payouts, *Total/TA*, is defined as the sum of dividend payouts (*dvc*) and net share repurchases divided by total assets (*at*). The calculation procedure of net share repurchases follows Fama and French (2001) and Skinner (2008).
- (v) Finally, regression analysis of a firm's leverage will include the following independent variables.
- Profitability is measured by *ROA*, calculated by operating income before depreciation (*oibdp*) divided by total assets (*at*).
  - Firm size is measured by *lnAsset*, the natural logarithm of a firm's total assets (*at*).
  - A firm's market-to-book ratio, *MBR*, is computed as  $(\text{total assets (at)} - \text{book equity (ceq)} + \text{market equity}) / \text{total assets (at)}$ , where market equity is stock price (*prcc*) times shares

outstanding (csho)).

- Size of a firm's fixed assets is measured by  $FA/TA$ , net property, plant and equipment (ppent) divided by total assets (at).
- A firm's growth opportunity is measured by  $RD/Sales$ , R&D expenditures (xrd) divided by sales (sale). Following Bates et al (2009), R&D is set equal to zero when it is missing in COMPUSTAT.
- Depreciation is measured by  $Dep/TA$ , a firm's depreciation and amortization (dpc) divided by total assets (at).
- A firm's general and administrative expenditure is  $GE/TA$ , a firm's selling, general and administrative expenses (xsga) over total assets (at).
- A firm's sales volatility is measured by  $SAVOL$ , a standard deviation of the ratio of a firm's sales (sale) to total assets (at) in the most recent 10 years.

**VITA**

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