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Organized labor and information asymmetry in the financial markets

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Abstract Prior results from the labor relations literature suggest that revealing information weakens management's position in collective bargaining. Thus, when facing organized labor, management has an incentive to preserve the information asymmetry with outsiders. This study uses a sample from a large cross-section of the economy over several years to test this relation. Results are consistent with this prediction. Strong organized labor is associated with higher bid-ask spreads, higher probability of informed trading, lower trading volume and lower analyst coverage. These relations hold after controlling for numerous factors such as growth opportunities or risk.

Keywords Information asymmetry · Labor relation

JEL Classifications: M41 · D82 · J50 · G39

This study examines if ''strong'' organized labor (i.e., labor able to extract a large proportion of the firm's resources) is associated with higher information asymmetry between informed and uninformed investors in the financial markets.

The literature has already documented that firms facing strong labor tend to select income-decreasing accounting choices. However, the link between labor and information asymmetry is less understood. Unions need information to function effectively but management may hide information that labor is unable to extract by itself. For example, Leap (1991) notes ''the union generally does not have access to the employer's production, financial, and personnel information'' and may have to sue to obtain some of this information. Nevertheless, management does not have to reveal business and trade secrets

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to labor negotiators. Hence, management retains discretion on what should or should not be revealed. A seemingly accepted view among practitioners is that further reducing the information asymmetry would be damaging to management. Several studies (detailed in Sect. 2) support this view. They indicate that information sharing is associated with increased bargaining power among American unions.

The empirical results presented in this study are consistent with this idea. Specifically, they show strong organized labor is significantly and positively correlated with bid-ask spreads and probabilities of informed trading (PIN) but negatively correlated with trading volume and analyst coverage. The links are robust to different econometric specifications and hold both in cross-sectional and in panel settings. Additional tests rule out the possibility that the association with spreads is due to higher administrative or inventory costs (idiosyncratic risk). For example, the standard deviations of both prices and returns are lower for firms with strong labor, suggesting that idiosyncratic risk and the inventory component of the spreads is not higher for those firms. This indicates that the association is due to information asymmetry, the third component of spreads. This interpretation is reinforced by the negative relation between strong labor and analyst coverage, an alternative proxy for information asymmetry unaffected by micro-structure issues. This relation is robust to different controls for idiosyncratic risk, growth opportunities and numerous other factors such as market structure, size, economic performance, outside monitoring, complexity of the firm, managerial incentives and the importance of the cost of capital for the firm. In other words, the asymmetry is not due to an intrinsically greater uncertainty about the corporate performance or growth of those firms.

This study contributes to the literature by establishing an empirical link between labor strength and information asymmetry in financial markets. The result, based on a large cross-section of firms over several years, is robust to alternative empirical specifications. It furthers our understanding of the informational environment in relation to stakeholders. This approach differs from, but complements, research on the effect of labor on accounting choices. In particular, it is consistent with the perception by American managers that reducing information asymmetry is harmful to their interests.

The rest of the study proceeds as follows. Part 1 reviews prior literature and develops the main hypothesis. Part 2 describes the empirical design. Part 3 provides the main results. Part 4 offers some concluding remarks.

1 Literature review and hypothesis development

1.1 Does information asymmetry help management in labor negotiations?

A seemingly accepted view among practitioners is that reducing the information asymmetry with labor would be damaging to the management. For example, Reynolds, Masters, and Moser (1998) state in a commonly used

manual on labor relations that ''an important feature of the [labor] negotiations is an effort to conceal or even misrepresent one's true position''. This idea is supported by empirical, clinical and experimental evidence.

Empirically, Kleiner and Bouillon (1988) report that information sharing is associated with increased bargaining power for American unions. They interpret this result as suggesting that more information enables unions to bargain more effectively and gain more resources. They examine the effects of management-initiated information sharing with production employees in 106 union and non-union manufacturing businesses. Their results show that disclosing information about the firm's financial condition, productivity, future investments and relative wages was significantly related to higher levels of wages and benefits for production employees in both unionized and non-unionized firms. Contrary to managers' expectations, providing additional information did not improve productivity. Scott (1994) describes how Canadian firms facing a higher likelihood of strike or operating in an industry with high average salaries reduce the amount of information provided on pension-related issues.

Clinical results also support the idea that reducing information asymmetry helps unions. Frost (2000) describes examples of decentralized bargaining between local unions and plant managers about restructuring an industrial process. She lists ''accessing information'' as one of the key factors for local unions to secure favorable results. The local negotiations that Frost observed were different from tri-annual firm-wide talks and were conducted over several years. This suggests that the importance of information is not limited to major negotiations but that there is a continuous demand for information from the unions. Kochan and Katz (1988) report that few mechanisms exist in the United States for entry-level labor–management information compared with countries with less adversarial systems. This result is also consistent with the observation that American managers perceive that reducing their informational advantage over labor is damaging.

Experimental evidence is also consistent with this hypothesis. For example, Croson (1996) offers the results of the following experiment. A fully informed ''Proposer'' and a ''Responder'' share $10 if they can both agree on the split. The ''Responder'' may or may not be informed about the total pay-off. Croson reports that the ''Proposer'' makes significantly lower offers when the ''Responder'' is not informed and that the ''Responder'' is more likely to accept the (lower) offer when uninformed. This form of bargaining is clearly a special case. In particular, it ignores dynamic aspects of the negotiation. However, this result would suggest that management would be better off negotiating with an uninformed labor.

1.2 A possible theoretical explanation

If the results discussed in the previous section suggest that reducing information asymmetry with labor is costly, they do not address the issue of why such costs may exist. The following discussion provides an explanation that is

consistent with this apparent cost. However, it is important to note that this study does not aim to test any model in particular. Instead, it presents empirical results consistent both with the preliminary empirical results above and with the intuition discussed below.

Analytical research suggests the existence of benefits from voluntary revealation of information to capital markets.[1] The empirical literature generally supports the existence of these benefits.[2] In the absence of costs (e.g., Jovanovic, 1982) or uncertainty about the existence of information (e.g., Dye, 1985; Jung & Kwon, 1988), the theoretical literature suggests that firms should follow a policy of fully eliminating the information asymmetry. The main intuition is that, when a price-maximizing manager withholds information, investors' suspicions about the quality of the investment are so great that they discount its quality to the point where the manager is better off with a policy of entirely removing the information asymmetry.[3]

However, in the presence of economically significant stakeholders, the manager must balance her actions to consider the potentially conflicting goals of all parties (e.g. employees, shareholders) that may affect her objective function. This complexity affects the financial communication policy. The often-maintained hypothesis in the earnings management literature is that managers have incentives to artificially increase reported earnings.[4] However, those facing strong labor also have incentives to bias reported results downward.[5] For example, Cullinan and Knoblett (1994) find that labor influences accounting policy choices in several industries. Bowen, DuCharme, and Shores (1995) report that labor-intensive firms or firms that offer a defined pension benefit are more likely to adopt income-decreasing accounting methods. D'Souza, Jacob, and Ramesh (2001) report that unionized firms are more likely to use the immediate recognition option under SFAS 106.

The relative importance of these conflicting goals (i.e., over- versus under-reporting) in any given period is not obvious for outsiders. For example, DeAngelo and DeAngelo (1991) document the use of accounting numbers to obtain concessions from unionized workers in the steel industry during the 1980s. The authors show that managers report larger losses in years when

[1] For example, disclosure is expected to increase liquidity (e.g., Diamond & Verrecchia, 1991; Kim & Verrecchia, 1994), to reduce the cost of capital (e.g., Barry & Brown, 1984, 1985, 1986), or to increase information intermediation (e.g., Bhushan, 1989a, b; Diamond, 1985; Lang & Lundholm, 1993).

[2] See Healy and Palepu (2001) for a review.

[3] See, for example, Akerlof (1970) or Grossman (1981).

[4] See Healy and Wahlen (1999) for a review. Reasons for managing earnings upwards may include issuing stocks or making stock-based acquisitions, meeting analysts' forecasts or catering to a particular clientele of investors. The literature also contains rarer examples of management using accounting choices to lower reporting earnings: managers who want to shift earnings to the following period since they were unable to reach their target in the current period (Healy, 1985), firms with high political costs (Watts & Zimmerman, 1986), before a management buy-out (Perry & Williams, 1994) or before a stock plan repurchase (Aboody & Kasznik, 2000).

[5] See Liberty and Zimmerman (1986) for a discussion of the incentives to decrease income on average.

labor negotiations occurred. This finding may be surprising. Considering that the steel industry was experiencing difficult economic times and declining stock prices, one may have expected the firms to try to over-report earnings instead of artificially depressing them. Making matters more complicated, managerial objectives are likely to change over time as a function of expected investments, technology changes, manager's time horizons and other strategic considerations. These shifts are not readily observable by outsiders or by labor.[6]

In turn, this uncertainty about managerial objectives in any given period[7] may prevent the receiver from unraveling any bias in reporting. For example, Cukierman and Meltzer (1986)[8] show that, even if the information recipients have rational expectations and are capable of learning, biasing is still beneficial for the manager.[9] The intuition is that the manager "derives a positive gain, on average, from the ability to create surprises because it can allocate large positive surprises to periods in which [the incentive to positively bias] is relatively high and leave the inevitable negative surprises for periods with relatively low values of (the incentive to positively bias)". Thus, the uncertainty concerning her objectives gives a valuable option to the manager to convincingly manipulate reporting, *both* for financial markets and for labor negotiations.[10] Fisher and Verrecchia (2000) propose a model where the *ex ante*[11] net benefit of biasing the report is positive if there is sufficient uncertainty about managerial objectives.

Additional revelation of information by the firm would reduce the value of this option by making more apparent both the goals of the managers and the methods used to manipulate reporting. For example, revealing the intention to close a factory in the near future would hint that managers are currently trying to bias earnings downward; revealing information about unconsolidated subsidiaries may indicate how this bias has been obtained. Since revelation of information is costly in this case, the manager has an interest in reducing it and in behaving strategically to maintain her informational advantage. For example, Cukierman and Meltzer (1986) show that the manager will reduce the speed at which the public becomes aware of changes in managerial

[6] This is particularly true since Katz (1993) reports a tendency in North America toward decentralized bargaining instead of centralized negotiations in the firm. This decentralization adds complexity to the negotiation process. Frost (2000) empirically describes the importance of information for labor in decentralized negotiations.

[7] In this setting, uncertainty means the distribution of incentives is known but not the period-specific realizations.

[8] Other examples using the uncertainty of objectives include Alesina and Cukierman (1990) and Eijffinger, Hoeberichts, and Schaling (2000).

[9] They use their model in the context of a government biasing reporting about money creation instead of a manger biasing reporting about economic value creation. I have substituted manager for government in the description of their model.

[10] Cukierman and Meltzer (1986) also show the average bias will be higher when the manager has more incentive to over-report. This is generally consistent with the empirical literature (e.g., Bowen et al., 1995; Cullinan & Knoblett, 1994; D'Souza et al., 2001).

[11] *Ex ante* here means before the period-specific incentives are known.

objectives when the incentives to over report are lower on average or when the uncertainty concerning managerial objectives in each period is higher.[12] This would be true when managers are facing strong labor.

Note that, in this framework, the manager considers *ex ante* the expected benefit of the option versus the cost of opacity (e.g., a higher cost of capital) and selects the optimal policy based on these expectations. To the extent that revealing information irredeemably damages the possibility of manipulating information (for example, by forfeiting the possibility in the future of pretending that certain information is unavailable),[13] the influence of labor on the level of the information revealed should be stable over time and should not be affected by temporary shocks, such as current labor negotiations or momentary weak economic performance. This can be related to findings suggesting that disclosure policies are not systematically modified around labor negotiations. For example, Yamaji (1986) finds that earnings are not harder to forecast around labor negotiations. Liberty and Zimmerman (1986) and Mautz and Richardson (1992) find no change in accounting policy around labor negotiations.

In summary, absent any cost of revealing information, theory suggests that managers should be entirely forthcoming. However, strong labor creates uncertainty about managerial incentives to over or under-report economic performance. This uncertainty gives management a valuable option to convincingly manipulate reporting, for both financial markets and labor negotiations. Additional reduction in information asymmetry is costly because it reduces the value of this option. This view is consistent with extant empirical literature that suggests that reducing information asymmetry will enable labor to extract more resources. This motivates the expectation of a higher level of information asymmetry compared to firms that do not have a similar option to bias.

1.3 Empirical challenges

This study examines direct measures of information asymmetry (discussed below). An alternative approach would be to focus on measures of raw disclosure (e.g., the number of press conferences) instead of information asymmetry, a measure of relative disclosure (e.g., the amount disclosed conditional on what is known by the manager). However, this approach would have at least two empirical problems.

First, unions and financial markets have numerous alternative sources of information. It is not immediately clear which ones should be used. This would not necessarily be a problem if all media where complements but prior literature suggests that various channels of raw disclosure may be substitutes for

[12] In their setting, this occurs when the distribution of incentives to over-report has a lower average or a higher variance.

[13] Consistent with this idea, Graham, Harvey, and Rajgopal (2005) provide survey evidence indicating that managers try to avoid setting a disclosure precedent that will be difficult to maintain.

each other. For example, Tasker (1998) finds an inverse relation between the informativeness of a firm's financial statements and the likelihood that the firm will use quarterly conference calls. Therefore, focusing on any particular medium may lead to spurious conclusions on the overall level of disclosure. On the other hand, proxies used in this study (trade-based measures and analyst coverage) are summary statistics for relative disclosure and enable us to bypass this issue.

Second, raw disclosure is likely to be endogenous with respect to information asymmetry. Absent any strategic considerations, a firm with high intrinsic asymmetry may increase raw disclosure, for example, to reduce the cost of capital. In other words, observing a high level of disclosure may indicate a high level of intrinsic information asymmetry. In principle, one could empirically address this endogeneity concern by using a Two-Stage Least Squares (2SLS) procedure. Absent such a specification, results would be difficult to interpret. However, this analysis would require having good proxies for raw disclosure and for the intrinsic asymmetry, being able to correctly specify the different functional forms and finding instruments to estimate the parameters. This seems to be a serious empirical challenge. For example, instruments correlated with information asymmetry but not with the error term of the raw disclosure regression are not obvious. As an alternative empirical strategy, I directly estimate the relation between information asymmetry and labor strength. To frame the issue in econometric terms, I estimate the reduced form system instead of the structural model.

To summarize, the link between labor strength and raw disclosure is not empirically tested to avoid several empirical problems such as the correlation between disclosure media and the endogeneity between raw disclosure and information asymmetry. Instead, the main hypothesis being tested is that labor strength is associated with higher information asymmetry in financial markets.

1.4 Proxies for information asymmetry

To test this hypothesis, I consider two types of proxies that are commonly used to measure information asymmetry: trade-based measures (bid-ask spread, in particular) and analyst coverage.

1.4.1 The relation between information asymmetry and bid-ask spread

The literature (e.g., Callahan, Lee, & Yohn, 1997; Stoll, 1989) explains that bid-ask spreads contain three components: order-processing costs, inventory holding costs and adverse selection costs. Order processing costs are the administrative costs for clearing the transactions. Inventory costs are the costs of holding disproportionate amounts of the security, therefore exposing oneself to an idiosyncratic risk of a non-diversified portfolio. The adverse selection component is arguably the one that has been the most studied. Its existence is theoretically well established: the spread will be higher when expected losses from trading with informed traders are larger. For example,

Copeland and Galai (1983) and Glosten and Milgrom (1985) show that a spread arises that is independent of any exogenous transaction or inventory cost. Trades with informed investors are on average unprofitable for uninformed traders. Therefore, uninformed participants have to be compensated to be induced to trade.

Empirically, the bid-ask spread has been used as a proxy for information asymmetry. Welker (1995) documents a significant negative relation between AIMR rankings within industries and firms' bid-ask spreads. The relation is robust to controlling for simultaneity in the determination of disclosure and spreads and to controlling for the effects of return volatility, trading volume and share price (factors that I also control for). Greenstein and Sami (1994), Coller and Yohn (1997), Healy and Wahlen (1999) and Leuz and Verrecchia (2000) provide additional empirical evidence while Bloomfield and Wilks (2000) offer experimental support for this relation.

1.4.2 The relation between information asymmetry and analyst coverage

I also consider analyst coverage. This second proxy is independent from micro-structure issues but is related to information asymmetry in two ways. First, there is an exogenous relation between analyst coverage and information asymmetry. Analysts acquire information otherwise unknown to market participants by interacting with management, visiting plants and so forth. Analysts also process and aggregate complex information in a way that unsophisticated or uninformed investors can understand. Hence, everything else equal, lower analyst coverage is likely to increase information asymmetry.

Second, there is an endogenous relation between information asymmetry and coverage. Prior literature has shown that analyst following is positively correlated with disclosure. Although the theoretical prediction is ambiguous *ex ante* (e.g., there could be a higher demand for analyst coverage when the firm is more opaque), the empirical literature has consistently indicated that the effect of the supply side (i.e., there are fewer analysts when lack of information makes coverage more costly) is more important than that of the demand side. For example, Francis, Hanna, and Philbrick (1997) have shown that firms making corporate presentations to analysts enjoy larger analyst coverage. However, they find no improvement in forecast dispersion, accuracy or bias.[14] Similarly, Lang and Lundholm (1996) and Healy and Wahlen (1999) report that firms who expanded voluntary disclosure (proxied by AIMR ratings) benefited from larger analyst coverage. Chang, Dasgupta, and Hilary (2006) use the number of analysts following a firm as a summary statistic for information asymmetry.

[14] Van Ness, Van Ness, and Warr (2001) report that there is no statistical relation between either analyst forecast errors or dispersion and the information component of the spreads (estimated using five different models). In addition, only considering firms for which a meaningful consensus or dispersion exists would require focusing on larger and better covered firms (e.g., firms with more than four analysts) where the effect is expected to be smaller.

Using financial analyst coverage as an additional proxy is also useful because it helps to identify who the informed traders are likely to be. If the higher spreads evidenced in Sect. 3 were due to trades based on information obtained from the unions, analysts would be unlikely to be concerned and would not reduce their coverage. On the other hand, if the higher information asymmetry were due to a reduction in information publicly available, the prior literature discussed above would suggest a reduction in analyst coverage.

2 Empirical design

I regress bid-ask spreads and analyst coverage against a measure of labor strength. The sample period runs from 1995[15] to 1999. Data are retrieved from the Trade and Quote (TAQ),[16] IBES, Compustat and the Center for Research in Security Prices (CRSP) databases. Utilities (SIC code between 49 and 50) and firms from the financial sector (SIC code between 60 and 68) are excluded since they have different incentives (e.g., Beatty, Chamberlain, & Magliolo, 1995; Ramesh & Revsine, 2000). The sample is restricted to firms listed on the NYSE, AMEX or NASDAQ.[17] ADRs or other securities incorporated outside the USA, preferred stocks or securities different from common stocks,[18] and "penny stocks" (i.e., firms with stock prices below $3) are excluded. To reduce the high computational costs of the spread, I follow the analyst literature (e.g., Francis & Philbrick, 1993) and focus on firms with a December fiscal year end. This leads to a sample with 3204 firms for which information on the main variables (i.e., spreads, analyst coverage and labor data) are available.

2.1 Dependent variable

2.1.1 Bid-ask spread (SPREAD)

Monthly median bid-ask spreads are first calculated. The median of monthly spreads is then calculated over the year for each firm. This procedure is designed to capture the "steady state" and to mitigate the effects of outliers and special events (e.g., take-over, seasoned equity offering). Callahan et al. (1997) suggest that the bid-ask spread should not be deflated in order to avoid spurious results due to variations in the deflator (price) instead of variations in the numerator (i.e., spread). However, most of the prior literature deflates the

[15] The TAQ database starts in 1993. However, unionization data are available only after 1995.

[16] To increase the integrity of the data, I only keep "good" and "regular" trades (as defined by TAQ). In particular, corrected trades (TAQ item CORR greater than 0) or conditional trades (TAQ item COND equal to A,B,C,D,G,J,N,O,R,S,T,W,X,Z,8 or 9) are deleted. Similarly, opening quotes (TAQ item MODE greater than 12) are removed.

[17] Firms where CRSP item ZLIST is different from 1, 3, 4, 5, 15, 17, 21, 23 or 25 are excluded.

[18] Securities where CRSP item SHRCD is different from 10 or 11 are excluded.

spread. Although results are only tabulated for the deflated spreads, they are essentially unaffected by this design choice.[19]

2.1.2 Probability of informed trading (PIN)

Aside from directly using the spreads, I also consider a related measure proposed by Easley, Kiefer, and O'Hara (1997) and Easley, Hvidkjaer, and O'Hara (2002). This proxy measures the prevalence of private information in trades. It is calculated through the estimation of a structural market microstructure model. The main intuition is that abnormal buy or sell volume can be interpreted as information-based trading. The more information-based trading, the more information asymmetry there is. For example, Easley et al. (2002) report that PIN is positively associated with spreads, the cost of capital and the variability of returns.[20] I use the values estimated by Easley et al. (2002) and accessible on the authors' website.[21] Note that this measure is mainly available for NYSE-listed stocks.

2.1.3 Analyst coverage (NbrAnal)

NbrAnal is the number of analysts that cover the firm on a yearly basis (as reported in the "Detail File" of IBES). Firms not included in the database are assumed to have zero coverage.[22]

2.2 Treatment variable

2.2.1 Labor strength (LSTR)

LSTR is calculated as the interaction of labor intensity (LINT) with unionization rate (R). LSTR is expected to be positively associated with spreads but negatively with trading volume and analyst coverage.

The unionization rate (R) (i.e., the percentage of employees in the industry who are represented by a union) was obtained through a request to the US Bureau of Labor Statistics. If the labor market is fully competitive, wages are exogenously determined. In this case, there should be no impact from firm-specific actions. Thus, unionization is a proxy for the degree of bargaining that

[19] Another point raised by Callahan et al. (1997) is that there is a small dispersion across spreads. This would reduce the power of the test but should not bias the results. In other words, a small dispersion is likely to understate the magnitude of the effect. However, results in Table 2 panel C suggest that there is some variation in spreads, at least when the entire distribution of firms is considered, and not only the largest ones.

[20] Since the details on the estimation of the model are fairly complex, the interested reader is referred to the original studies by Easley et al. (1997, 2002) for more technical details.

[21] www.smith.umd.edu/faculty/hvidkjaer/data.htm

[22] Results still hold in a sub-sample of firms with at least one analyst.

affects wages. This rate is calculated at the three-digit SIC code.[23] Rosen (1969) proposes an analytical model describing the effect of unionization ''spill-over''. In essence, spill-overs are externalities caused by the threat of unionization. In other words, the pressure of unions is not limited to their own firms but this pressure provides a credible threat to other firms in the same industry. The magnitude of this spill-over effect appears to empirically dominate the direct effect. Bronars and Deere (1994) empirically show that ''the total negative effects of unionization on profits, after cross-firm or spillover effects are included, are nearly three times as large as the own-firm effects''. They explicitly define the firms subject to the spill-over effect as the ones in the same industry. In this context, firm-specific proxies are likely to underestimate the effect of unions on information asymmetry.

The unionization rate is interacted with labor intensity (LINT) calculated as the firms' number of employees (Compustat item 29) scaled by its total assets (Compustat item 6). In other words, I use the ratio of the factors of production (labor to capital). If labor represents a very small proportion of the factors of production, it will not significantly affect the managers' decision: if capital represents 99% of the factors, managers will not be seriously concerned if labor doubles its share of the firm's resources. Although all firms in a similar industry will be subject to a comparable pressure from unions, the impact of the industry-wide pressure will be firm specific.

2.3 Control variables

I propose two models of control variables. Results from both models are reported and are qualitatively similar. The first one is more parsimonious. It minimizes the risk that the results are spuriously introduced by irrelevant control variables. A second, more extensive model introduces more control variables to minimize the risk of correlated omitted variables. The parsimonious model includes the following control variables:

(1) *Trading Volume* (VOL): The median daily volume is first calculated on a monthly basis for each firm. The median of monthly volumes (VOL) is then calculated over the year for each firm.[24] Spreads are expected to be decreasing in volume but analyst coverage should not be affected after controlling for size. Volume itself could be an alternative proxy for information asymmetry. When subject to uncertainty due to the absence of information about future cash-flows, a firm is likely to face high trading volume (e.g., Karpoff, 1986). However, in the presence of informational asymmetry, uninformed participants may not want to trade with potentially informed traders (e.g., Milgrom & Stokey, 1982; Wang, 1994). This prediction is consistent with the limited empirical

[23] See Freeman and Medoff (1979), Salinger (1984), Bronars and Deere (1991) for examples of using industry-level unionization data and financial data.

[24] Volume is double counted in the TAQ database for NASDAQ stocks. Therefore, following Krische and Lee (2000), I divide volume by 2 for stocks listed on the NASDAQ.

evidence (e.g., Leuz & Verrecchia, 2000). For completeness, I also investigate volume as a potential dependent variable.

(2) *Price* (Price): I use the log of price (per share at the end of the year) as a control in the micro-structure regressions. Spreads are expected to be decreasing in price but not proportionally. Therefore, Price is expected to have a negative coefficient in the spread regressions.

(3) *Market Dummies* (NASD): NASD is a dummy variable that takes the value of one if the stock is traded on the NYSE market, zero otherwise. Past research (e.g., Bessembinder & Kaufman, 1997; Huang & Stoll, 1996) suggests that firms traded on the NASDAQ are associated with a higher bid-ask spread. Huang and Stoll (1996) report that higher spreads are not due to differences in adverse information, but rather in micro-structure. Therefore, NASD can be seen as controls for cross-sectional variations of the order-processing component of the bid-ask spread.

(4) *Size*: Following prior literature (e.g., Scott, 1994), Size is the log of sales (Compustat item 12). Past literature has shown a negative link between size and the bid-ask spread and a positive relation between size and volume or between size and analyst coverage.

The extended model includes the following additional variables:

(5) *Sensitivity to cost of capital*: All managers are expected to minimize their cost of capital. However, the importance of this goal may vary cross-sectionally. I expect firms with higher sensitivity to the cost of capital to experience lower information asymmetry.

(5.1) Personal managerial incentives (ShrPc): The level of information asymmetry concerning the firm may be influenced by a manager's personal incentives. For example, if the manager owns a significant share of the equity of the firm, she may have a greater incentive to reduce the spread or the cost of capital. To control for this possibility, I include in the regression the percentage of equity held by insiders (the dollar amount of holdings by all executives of the firm as reported in Compustat divided by the market capitalization at the end of the period).

(5.2) Seasoned equity offering (SEO): A firm that issues equity may have an incentive to reduce information asymmetry to reduce adverse selection (Lang & Lundholm, 1993; Lundholm & Lang, 2000). To control for this possible effect, I include a dummy variable that takes the value of one if the firm issues equity in the US during the year, zero otherwise. Data are retrieved from the SDC database.

(6) *Risk and Growth Opportunities*: Idiosyncratic risk affects the inventory component of the bid-ask spread. Therefore, I use the following four variables as controls for risk. Risk is expected to be positively associated with spreads.

(6.1) Return Volatility (StRet): StRet is the standard deviation of the daily returns calculated for each firm each year. The data are retrieved from CRSP. Volatility is expected to be associated with higher bid-ask spreads (e.g., Stoll, 1978). In particular, it should control for the idiosyncratic risk of the security that increases the inventory component of the bid-ask spread.

(6.2) Leverage (Debt): I use the ratio of debt (Compustat items 9, 34 and 130) divided by equity (items 60, 35 and 71) as an additional measure of risk.

(6.3) Book-to-Market ratio (BM): BM is the ratio of book equity to market value. Firms with low book-to-market ratios have been shown to be more risky (e.g., Fama & French, 1993). An alternative interpretation for BM is a control for the growth option/investment opportunity set.

(7) Proxies for the level of *outside monitoring* in the environment of the firm. Monitoring by a rating agency is expected to decrease information asymmetry. I create *Rating*, a dummy variable that takes the value of one if there is a bond rating by Standard and Poor's in the Compustat database, zero otherwise.

(8) *Profitability*: Jovanovic (1982) suggests that higher quality sellers may be more forthcoming with information. In the absence of labor issues, more profitable firms may disclose more information. I control for this possible effect by introducing the variables below.

(8.1) Profitability (MeanRet, ROA): I use two proxies for profitability. MeanRet (Lang & Ludholm, 1993) is the arithmetic mean of the daily returns (calculated for the year). ROA is the return on assets calculated by dividing earnings before extraordinary items (Compustat item 18) by total assets (item 6).

(8.2) Concentration (Herf): Industry concentration is measured using the Herfindahl index. Harris (1998) shows empirically that a higher industry concentration is associated with lower disclosure of segment information. This would suggest a positive link between concentration and information asymmetry.

(9) Proxy for the *complexity* of the firm: A more complex firm is expected to be associated with higher information asymmetry. Industries with strong organized labor do not appear to be particularly complex. They largely belong to basic goods industries or to low-technology service industries (see Table 1, Panel B). Nevertheless, I include NbrSeg, the number of industrial segments, as reported in Compustat.

3 Empirical results

3.1 Descriptive statistics

Table 1 provides the unionization rate by industry and year. It ranges from less than 2% in the agricultural industry to over 40% in the automobile industry. Unionization is generally low in the service industry. Table 2

Table 1 Unionization rate

	1995	1996	1997	1998	1999
Agri-services	2.3	2.5	2.6	1.1	2.9
Other agriculture	1.9	1.2	1.8	1.8	2.0
Mining	13.8	14.1	13.9	12.2	10.6
Construction	17.7	18.5	18.6	17.8	19.1
Lumber	13.2	12.3	10.7	10.4	8.8
Furniture	9.3	9.1	7.0	7.2	7.0
Stone	22.5	23.7	22.8	23.3	20.6
Primary metals	38.5	41.5	38.0	34.0	35.3
Fabricated metals	18.7	18.2	18.4	16.1	15.8
Machinery	12.7	10.6	11.7	12.1	10.6
Electrical equipment	10.5	12.7	11.1	11.1	10.9
Motor vehicle	42.9	44.9	40.2	36.4	36.9
Aircrafts	31.3	27.1	29.0	27.1	28.7
Other transport	22.4	16.5	16.6	16.5	16.8
Photographic	6.5	4.8	6.5	4.9	5.1
Toys	3.7	4.9	5.0	7.5	4.5
Other	9.0	8.2	7.4	7.5	10.4
Food	23.3	24.0	23.7	22.8	22.4
Tobacco	18.4	15.9	20.2	23.0	25.1
Textile	5.2	5.8	6.0	5.5	5.1
Apparel	13.2	9.6	8.4	7.4	8.4
Paper	30.8	34.6	28.0	29.9	26.3
Printing	8.1	7.8	7.9	8.8	8.3
Chemicals	13.9	11.6	11.0	11.7	10.3
Oil	25.1	23.6	22.9	18.3	22.4
Rubber	15.5	14.4	14.5	14.0	16.3
Leather	20.0	22.0	19.0	17.8	13.3
Transportation	27.3	27.0	26.5	25.7	25.5
Communication	27.8	23.5	21.5	26.0	25.4
Wholesale	6.6	6.2	5.8	5.9	5.4
Retail	6.0	5.5	5.5	5.2	5.1
Households	1.1	1.1	.5	1.2	.9
Business service	3.4	2.8	2.7	2.9	3.0
Car service	2.8	3.4	3.5	2.8	4.3
Personal service	5.1	7.7	5.5	6.9	6.4
Entertainment	7.2	7.1	6.4	6.3	7.5
Hospitals	11.4	11.3	11.0	10.6	10.7
Health	4.5	5.1	4.4	5.0	4.5
Education	12.6	12.6	12.7	12.6	12.4
Social	2.7	2.3	2.8	3.0	3.2
Other service	2.6	2.0	2.4	2.4	2.3

The unionization rate is the percentage of the workforce belonging to a labor union or an employee association similar to a union as indicated by the Bureau of Labor Statistics

Table 2 Descriptive statistics

	Mean	Median	Std
Panel A: Summary statistics of labor-related variables			
Unionization	13.7%	11.9%	9.7%
LINT	.097	.055	.294
LSTR	.011	.006	.017
Panel B: Top 10 industries ranked by average LSTR			
SIC	Nobs	Designation	
458	4	Airports and airport terminals	
736	85	Personnel supply services	
339	6	Miscellaneous metal products	
410	5	Local and interurban transit	
371	213	Motor vehicles and equipment	
332	9	Iron and steel foundries	
421	163	Trucking	
239	8	Miscellaneous textile	
734	14	Services to buildings	
265	12	Paperboard containers/boxes	
314	41	Footwear	
Panel C: Summary statistics of relevant variables			
	Mean	Median	Std
SPREAD	2.60%	1.92%	2.58%
PIN	17.63%	16.26%	7.21%
Analyst coverage	6.98	4.00	8.51
Size	5.34	5.29	2.12
Price	22.52	16.94	20.25

Unionization is the unionization rate (at the three digit SIC code) as reported by the US Bureau of Labor Statistics

LINT is the labor intensity defined as the ratio of employees to total assets (Compustat item 29 divided by item 6)

LSTR is the product of labor intensity and the unionization rate

SPREAD is the yearly median of the 12 monthly median spreads (in dollars per share) deflated by price

Price is the price in dollars per share at the end of the year

provides additional descriptive statistics. Panel A reports summary statistics for R, LINT and LSTR. The average unionization rate in the sample is close to 14% and has both cross-sectional and time series variation. For example, I calculate the mean and the standard deviation of R by industry. I then take the ratio of the standard deviation divided by the industry mean of R. The overall sample of these ratios is 12%. In other words, the average standard deviation over time in a given industry is greater than 10% of its mean. A similar procedure on cross-sectional variations gives an overall sample mean of 75%, indicating a high level of cross-sectional variation. A regression of LINT on industry dummies has a coefficient of determination of 5%, suggesting that LINT is largely a firm specific variable (as intended). Panel B reviews industries where labor is the strongest. Not surprisingly, low-technology service industries and basic goods sectors are largely represented. These sectors do not appear to be intrinsically more risky or difficult to evaluate. Panel C indicates

Table 3 Pearson correlation table

	PIN	VOL	NbrAnal	Size	Price	StRet	LSTR
SPREAD	.46	–.04	–.42	–.42	–.48	.32	.08
PIN		–.32	–.47	–.59	–.31	.11	.09
VOL			.26	.15	.35	.06	–.05
NbrAnal				.53	.47	–.25	–.08
Size					.48	–.55	.13
Price						–.30	–.04
StRet							–.13

All correlations are significant at less than the .00% level. Results are based on 8028 observations (except for PIN where 3,309 observations are used)

LSTR is the product of labor intensity (Compustat item 29 divided by item 6) and the unionization rate (at the three-digit SIC code level)

SPREAD is the yearly median of the 12 monthly median spreads (deflated by price)

VOL is the yearly median of the 12 median monthly volumes

Size is the log of sales (in millions of dollars)

Price is the log of price (in dollar per share at the end of the year)

StRet is the standard deviation of the daily returns calculated for each firm each year

NbrAnal is the number of analyst covering a firm as reported in IBES

that, although the percentage spread might be small for larger firms, the spread represents 2.6% of the stock price on average.[25] Table 3 offers a correlation table. Results show that labor strength is positively correlated with spreads and PIN but negatively correlated with trading volume and analyst coverage. In addition, the correlation between LSTR and size or the standard deviation of returns is negative. Although univariate correlations are hardly conclusive, this suggests that the association between spreads and LSTR is not due to higher risk.

3.2 Bid-ask spread and other trade-based proxies

The results for the bid-ask spreads are presented in Table 4 for the parsimonious (Column 1) and extended model (Column 4). Both models are qualitatively similar. They indicate a positive and significant relation between labor strength and bid-ask spreads. The standard errors in the OLS specifications are adjusted for heteroskedasticity and allow for clustering of observations by year. The corrected *t*-statistic for LSTR is 6.90 in the parsimonious model and 8.62 in the extended one. The results (not tabulated) are also stronger when I exclude outliers (defined as observations where SPREAD, or LSTR is in the top or bottom 1% of the distribution) or when I use a median regression. In this case, the *t*-statistics (not tabulated) range between 2.51 and 15.74. I also consider a panel setting (either random effect or maximum likelihood estimator). Results

[25] In addition, the effect on other variables such as the cost of capital is not considered in this study. The total effects are therefore likely to be greater than just the effect on spreads and analysts evidenced in Sect. 4.

Table 4 Bid-ask spreads and other trade-based measures

	SPREAD	PIN	VOL	SPREAD	PIN	VOL
Intercept	7.03 (14.49)	.34 (51.22))	–.49 (– 4.08)	6.07 (26.91)	.36 (21.02)	–.79 (–2.67)
LSTR	9.41 (6.90)	.49 (8.42)	–1.88 (– 4.64)	8.88 (8.62)	.27 (5.13)	–.33 (–1.70)
NASD	.04 (.16)	–.03 (–2.78)	.07 (3.20)	.07 (.39)	.02 (–1.63)	–.02 (–1.08)
Size	–.06 (–2.12)	–.02 (–14.93)	.17 (1.05)	–.08 (–3.84)	–.02 (–11.28)	.01 (1.25)
Price	–1.60 (–8.34)	–.01 (–11.62)	.16 (2.10)	–1.28 (–19.22)	–.01 (–5.81)	.16 (1.78)
Vol	.07 (1.95)	–.01 (–1.72)		.08 (1.84)	.01 (2.33)	
Spread			.01 (1.83)			.01 (1.26)
StRet				.03 (.50)	–.01 (–3.76)	.07 (2.30)
BM				.18 (4.55)	.01 (4.19)	–.00 (–.44)
Debt				.38 (4.32)	.04 (10.64)	–.05 (–1.81)
NbrAnal				–.02 (–6.60)	–.00 (–11.99)	.01 (5.69)
Rating				–.01 (–.52)	–.02 (–6.51)	.01 (.98)
MeanRet				–.12 (–1.11)	.04 (3.15)	.04 (1.37)
ROA				.01 (1.68)	.02 (5.88)	–.00 (–.42)
Herf				.22 (1.89)	.00 (.25)	–.01 (–.11)
NbrSeg				.00 (.13)	–.00 (–1.43)	.02 (6.05)
ShrPc				–.00 (–7.17))	–.00 (–2.02)	–.00 (–2.18)
SEO				–.16 (–1.34)	–.00 (–.10)	–.08 (–1.53)

Table 4 continued

	SPREAD	PIN	VOL	SPREAD	PIN	VOL
R^2	39.37	35.91	6.85	46.23	43.66	20.23
N	9088	3706	9088	8028	3309	10,274

SPREAD is the yearly median of the 12 monthly median spreads (in dollars per share) deflated by price

PIN is the probability of informed trading

VOL is the yearly median of the 12 median monthly volumes (in billions of dollars)

LSTR is the product of labor intensity (Compustat item 29 divided by item 6) and the unionization rate (at the three-digit SIC code level)

Size is the log of sales (in millions of dollars)

Price is price (in dollar per share at the end of the year)

NASD is a dummy variable that takes the value of one if the stock is traded on the NASDAQ market, zero otherwise

StPrice is the standard deviation of the daily price calculated for each firm each year

BM is calculated as the log of the ratio of book equity to market value

Debt is calculated as the ratio of debt (Compustat items 9, 34 and 130) divided by asset

NbrAnal is the number of analysts that cover the firm (as reported by IBES)

Rating is a dummy variable that takes the value of one if there is a bond rating by Standard & Poor's, zero otherwise

MeanRet is the arithmetic mean of the daily returns (calculated for the year)

ROA is calculated by dividing earnings before extra-ordinary items (Compustat data 18) by total assets (data 6)

Herf is the Herfindahl index calculated at the three-digit SIC code level

NbrSeg is the number of industrial segments reported in Compustat

ShrPc is the percentage of equity held by insiders (the dollar amount of holdings by all executives of the firm as reported in Compustat divided by market capitalization at the end of the period)

SEO is a dummy variable that takes the value of one if the SDC database reports that the firm issued equity in the US during the year, zero otherwise. The standard errors are estimated by least squares, are robust and allow for clustering of observations by year

(not tabulated) are very similar to the ones reported in Table 4 (the *t*-statistics range between 9.90 and 12.68).

The coefficients on the control variables generally have the expected signs. NASDAQ and smaller firms have larger spreads. As expected, Price and Size have negative coefficients. The measures of risk (StRet, BM, Debt) are positively correlated with higher spreads and are generally significant. Spreads are lower when there is better outside monitoring of the firm (the effect of the number of analysts is particularly strong) or when managers are more sensitive to the cost of equity. Perhaps the only surprising result is the lack of significance for the measures of profitability. This result can be explained by the high number of control variables.

I also consider two additional measures of information asymmetry as dependent variables: PIN and trading volume. In the PIN regressions (Columns 2 and 5 of Table 4), LSTR is consistently positive in all the specifications similar to the ones used with SPREAD. The corrected *t*-statistic is 8.62 in the parsimonious model (Column 2 of Table 4) and 5.13 in the extended model (Column 5). In other words, increasing labor strength reduces the likelihood that trades are carried out for liquidity purposes and increases the likelihood that they are based on private information. When I use the trading volume as a dependent variable, LSTR is negative with *t*-statistics between –4.64 (Column 3) and –1.70 (Column 6). This result is consistent with the ''no trade theorem'' (Milgrom and Stokey, 1982) that suggests that trade will be reduced in the presence of higher information asymmetry.

Finally, to further investigate whether the results are caused by the inventory component of the spread, I regress both price and return volatility on LSTR and the control variables of the extended model. Results (not tabulated) indicate that both volatilities are negatively associated with labor strength (although the significance of this result varies across specifications).[26] To ensure that the results are not driven by higher operational leverage, I add different additional control variables to the extended specification: the standard deviation of the gross margin, the standard deviation of the ratio of costs of goods sold and selling, administrative and general expense over sales and a measure of bankruptcy risk (Ohlson's, 1980, *Z*-score). Results (untabulated) still hold. For example, the corrected *t*-statistics in the spread regression becomes 7.75. This would suggest that inventory costs would be lower for those firms and, therefore, do not drive the spread results. This is also consistent with the finding by Freeman and Kleiner (1999) that unions do not increase the insolvency rate.

To summarize, empirical results show a positive relation between labor strength and spreads. Spreads are composed of three components. Different tests rule out the possibility that this relation is due to micro-structure factors or to higher inventory costs (idiosyncratic risk). This indicates that the empirical

[26] Rosett (2001) reports that firms with high labor intensity and unionization experience higher return volatilities and higher market betas. The difference between the results may possibly be explained by a difference in the sample. Rosett's study has 687 observations from highly unionized and fairly large firms. This sample contains about 10,000 observations and covers both low-unionized and highly unionized firms.

Table 5 Analyst coverageStandard errors are robust and allow for clustering of observations by year. See Table 4 for a description of the variables

	NbrAnal	NbrAnal
Intercept	–.28 (–.68)	–.21 (–.38)
LSTR	–66.60 (–14.34)	–51.84 (–12.41)
NASD	.42 (2.40)	.19 (1.25)
Size	1.85 (30.96)	1.78 (52.77)
StRet	.19 (13.05)	.29 (3.78)
Spread	–.94 (–10.53)	–.75 (–14.16)
BM		–.77 (–4.35)
Debt		–4.20 (–22.02)
Rating		3.72 (26.62)
ROA		.00 (.23)
NbrSeg		–.03 (–.29)
SEO		1.70 (3.50)
Herf		–4.36 (–9.07)
ShrPc		– .00 (–.15)
R^2	34.56	39.50
N	8028	8028

relation is due to the last component, information asymmetry. The asymmetry is the difference between what is known by the most informed traders but not disclosed to uninformed traders. This relation is robust to controls for growth options, risk, managerial incentives and numerous other factors. In other words, the relation is not due to a greater intrinsic uncertainty about firm performance. This interpretation is reinforced by a positive relation of labor strength with probability of informed trading (PIN) and a negative one with volume.

3.3 Analyst coverage

The results from the analyst coverage regressions are presented in Table 5 for both the parsimonious model (Column 1) and the extended one (Column 2). The standard errors are adjusted for heteroskedasticity and allow for clustering of observations by year as in Table 4. Both models indicate a significantly negative relation between labor strength and analyst coverage. The *t*-statistics for LSTR are –14.34 and –12.41. Results still hold when I use panel specifications (with a *t*-statistic close to –5.4) or a count-data estimation technique (e.g., Rock, Sedo, & Willenborg, 2000, the *t*-statistic equal –7.65). Analyst coverage is increasing in size, price volatility, issuance of security and outside bond rating but debt, book-to-market ratio, market concentration and spreads.[27]

To summarize, these empirical results establish a negative link between labor strength and analyst coverage. Analyst coverage has been used by prior literature as a direct summary measure for information asymmetry. This result is consistent with the result found in Sect. 4.1 and reinforces its interpretation based on an informational explanation.

[27] As in Rock et al. (2000), the sign and the significance of some of the control variables are affected if we use a count-data estimation technique.

4 Conclusion

This study examines whether the existence of strong organized labor is associated with higher information asymmetry between informed and uninformed market participants. Prior literature suggests that reducing information asymmetry weakens management's position in collective bargaining. A possible theoretical explanation is that strong labor increases the ambiguity concerning managerial objectives. This ambiguity gives management a valuable option to credibly manipulate expectations and in turn an incentive to protect its information asymmetry to preserve this option. The empirical results are generally consistent with this hypothesis and show a positive relation between labor strength and spreads and the probability of informed trading as well as a negative one between labor strength and both trading volume and analyst coverage.

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