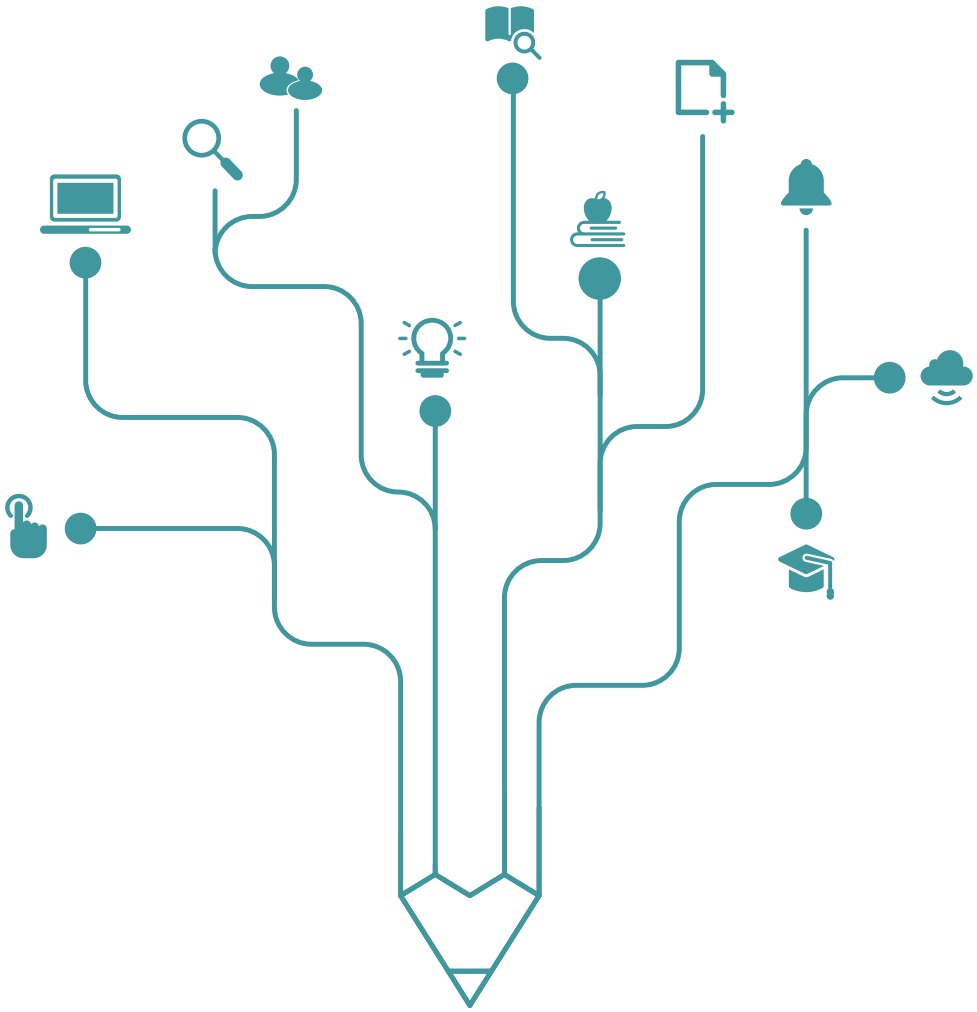
KDIS Working Paper 24-02

Forecast Disagreement about Firm-level Profitability and Uncertainty

Seohyun Lee (KDI School of Public Policy and Management)



KDI SCHOOL
KDI School of Public Policy and Management

Forecast Disagreement about Firm-level Profitability and Uncertainty*

Seohyun Lee

February 18, 2024

Abstract

This paper proposes a measure for firm-level uncertainty using forecast disagreement among financial analysts in South Korea for the period between 2003Q1 and 2019Q4. I find that, at the aggregate level, the disagreement measure of uncertainty is positively correlated with the Economic Policy Uncertainty (EPU) and negatively correlated with GDP growth, both with lags. To investigate the real option channel of uncertainty, the impact of firm-level uncertainty on investment is estimated, controlling for firm-level first-moment shocks and financial conditions. The results suggest that the firm-level disagreement measure of uncertainty adversely affects the investment and such effects are more severe for firms with high levels of irreversible investments. There is empirical evidence suggesting that the impacts on other real activities are consistent with the real option theory—sales, employment and investment in R&D are discouraged by uncertainty shocks. Financial decisions of firms are affected by firm-level uncertainty shocks—firms reduce debt and increase payout when faced by higher uncertainty.

JEL Classification: E22, D84
Keywords: Firm-level uncertainty, Disagreement, Investment, Dividend

*I thank seminar participants at KDI School of Public Policy and Management for useful suggestions. I thank Yumi Park for outstanding research assistance. This research is supported by KDI School of Public Policy. Contact: KDI School of Public Policy and Management, Republic of Korea; slee6@kdis.ac.kr.

1 Introduction

The existing literature on uncertainty emphasizes the measurement of time-varying aggregate uncertainty and the understanding of the nature of uncertainty shock and its macroeconomic consequences (Bloom, 2014; Jurado et al., 2015, among others). A strand of literature considers disagreement among professional forecasters as a measure of uncertainty (e.g. Lahiri and Sheng, 2010). The empirical papers on disagreement uncertainty mainly exploit the survey of professional forecasters collected by the central banks. Generally, these surveys offer information on the expectations for inflation, GDP growth, and unemployment, all of which are limited to macroeconomic outcomes.

While the impact of uncertainty shocks on macroeconomic activities is well-documented in the literature, the study on firm-level uncertainty is scant. Idiosyncratic firm-level uncertainty may exhibit different propagation mechanisms through which uncertainty affects firms' real and financial decisions. Some previous studies focuses on the effect of uncertainty on investment and employment at the firm-level (Leahy and Whited, 1996; Bloom et al., 2007; Panousi and Papanikolaou, 2012; Kim et al., 2023) and others the impact of uncertainty on firm financing policies such cash holdings, dividends and debt at the firm-level (Alfaro et al. (forthcoming)). A large volume of the literature uses the realized volatility of stock returns as a firm-level measure of uncertainty.

This study aims to fill the gap in the literature by providing micro-level empirical evidence of uncertainty effects by employing a disagreement measure of firm-level profitability. In particular, I construct a measure of uncertainty at the firm-level using the analysts' forecast disagreement about the firm-level profitability, proxied by earnings per share, using the South Korean database, FN Guide, for the period 2003Q1-2019Q4.

The link between disagreement among analysts' forecasts and uncertainty can be established if high disagreement among the forecasters reflects high uncertainty shared by them. However, the relationship between the two can be weak if disagreement about the future is driven by factors unrelated to uncertainty. The relationship between the behavior of disagreement and uncertainty

has been studied extensively and the empirical findings remain inconclusive. Some studies find that forecaster disagreement is positively related to common proxies for uncertainty (Giordani and Söderlind, 2003; Dovern, 2015). However, recent studies suggest that the link is relatively weak (Boero et al., 2015; Rich and Tracy, 2010; Glas, 2020). Utilizing the novel measure, this study finds the positive correlation between forecaster disagreement uncertainty at the firm-level and economic policy uncertainty.

Furthermore, the research examines the impact of uncertainty at the firm level considering various channels and outcomes, including investment, employment, and financial structure of the firms. The empirical results suggest the real option effects of uncertainty. Higher level of disagreement uncertainty about 1-year-ahead profitability is negatively associated with investment and such effects are more pronounced for firms with higher degree of investment irreversibility (Gulen and Ion, 2016; Kim et al., 2023). Borrowing constraints exacerbate the adverse impacts of uncertainty, suggesting the amplified uncertainty effects due to financial frictions (Arellano et al., 2019; Alfaro et al., forthcoming). The estimated effects of uncertainty on other real variables, sales, R&D investment, employment, are consistent with the real option theory–uncertainty shocks are damaging for firms' real outcomes. Finally, dividend tends to increase in response to uncertainty shocks, which is counterintuitive in the context of precautionary cash savings channel. The results can be explained by agency theory of dividend as in Attig et al. (2021). During the uncertain times, managers may have incentives show a conservative manner in the use of firm's financial resource to reduce the problem of free cash flows.[1]

The paper is organized as follows. In Section 2, I explain how the measure of firm-level disagreement uncertainty is constructed. Section 3 describe the empirical strategy and data and Section 4 presents the empirical findings on the effects of disagreement uncertainty shocks on firms' real and financial activities. Section 5 concludes.

[1]Due the heightened uncertainty, investment decreases and firms may have abundant cash reserves. Managers can easily take advantage of this situation.

2 Disagreement measure of firm-level uncertainty

Measures on the dispersion of predictions made by individual professional forecasters are widely used to proxy the degree of uncertainty around the point forecasts for macro-level aggregate variables (e.g., GDP growth rate, inflation). To adopt such approach in the context of firm-level uncertainty, I use analysts' forecasts of earnings per share (EPS) in the Fn Guide database. Fn Guide database provides the forecasts of stock prices and various accounting items from analysts in the securities firms in South Korea. Total number of firms covered by the database is 2,481 Korean listed and delisted firms. The number of securities firms included in the database is 41, including the ones whose operations were closed either by exit or mergers and acquisitions. The unique ID for each individual analyst can be identified along with the name of security firms. Among other performance measures, I focus on EPS as the measure proxies the expected profitability of a company. EPS is defined as the portion of a company's profit allocated to each outstanding share of stock, computed as the net income for a given period divided by the total number of shares outstanding during the same period. The analysts' disagreement about the profitability can represent the firm-level uncertainty evaluated in the financial market.

There are two types of forecasts depending on how the forecasts are produced and reported: fixed-event forecasts and fixed-horizon forecasts. Fixed-event forecasts are the forecasts made for a specific calendar year while fixed-horizon forecasts are the ones holding a certain period of forecasting horizon, for instance, 12-months-ahead. The analysts' forecasts in Fn Guide database are fixed-event forecasts. Each individual forecasters report his/her forecasts about different accounting items and share prices for a specific calendar year or quarter. The problem is that fixed-event forecasts do not share the same forecasting horizon and the fundamental dispersion based on fixed-event forecasts may be biased because of different horizons of point forecasts. The dispersion across forecasters tend to be narrowed as the forecasting horizon becomes smaller—i.e. target date gets nearer.

To address potential issues due to the fixed-event forecasts in the raw data, I employ the ap-

proximation approach as in Dovern et al. (2012).[2] The method is to transform fixed-event forecasts to fixed-horizon forecasts with a appropriate weights considering the distance between the time of the forecast and the target date. Denote $\tilde{y}^0_{t,i}$ as the forecast for the variable y for the current calendar year at time t by forecaster i. Similarly, $\tilde{y}^1_{t,i}$ denotes the forecasts for the next calendar year at time t by the same forecaster, i. For example, in 2015Q2, we observe analyst i's forecast of the firm j's EPS for the current fiscal year, 2015, and the forecasts for the next fiscal year, 2016. To compute the fixed-horizon forecast of h, $\hat{y}^h_{t,i}$, I construct a proxy by taking a weighted moving average of fixed-event forecasts.

$$\hat{y}^h_{t,i} = w_1 \tilde{y}^0_{t,i} + w_2 \tilde{y}^1_{t,i} \tag{1}$$

where w_1 and w_2 is based on the relative distance from the date of forecasting and h is set to one year. For quarterly data, $w_1 = \frac{k}{4}, w_2 = \frac{4-k}{4}$ where $k = 4 - tq + 1$ for $tq \in \{1, 2, 3, 4\}$, the corresponding quarter of t. If a forecast is made in 2015Q2 ($tq = 2$), the weights are $w_1 = 3/4, w_2 = 1/4$.

Using the proxies of fixed-horizon forecasts for i's, I compute a measure of dispersion–the standard deviation across all individual forecasters at each t for each firm f, $DU^h_{f,t}$.

$$DU^h_{f,t} = \sqrt{\frac{1}{N-1} \sum_{i=1}^{N} (\hat{y}^h_{t,i} - \overline{\hat{y}^h_t})} \tag{2}$$

where $\overline{\hat{y}^h_t}$ is the average of fixed-horizon forecasts across all i's at a given time, t.

To improve accuracy and precision of the disagreement measure of uncertainty, I undertake several data cleaning processes. First, there is evidence of reporting errors and absurd outliers. For example, a few forecast values reported by an analyst jump to 10 times the value of the adjacent forecasts made by the same analyst, which indicates that the analyst may erroneously add one more zero when reporting the forecasts. Ignoring such errors leads to extremely large values of standard deviations. Although standard deviations are supposed to capture the diversions among forecasts, the existence of extreme values in forecasts may contaminate the measure significantly, leading to

[2] Also see Dovern and Fritsche (2008) for alternative approaches to deal with the problem.

measurement errors due to such outliers. To address issues regarding reporting errors and absurd outliers, I exclude the forecasts that are either greater than $99th$ percentile or smaller than $1st$ percentile. Second, I drop the observations for firm j that has less than 10 analysts' forecasts since a small sample would lead to an inadequate representation of population standard deviation of forecasts.

Normalization of standard deviations is another issue. By construction, large standard deviations may reflect either a high degree of disagreement *per se*, or a high average level of a target variable, or both. To compare the disagreement measures of firms with different levels of EPS, I compute the Coefficient of Variation (CV). Normally, CV is defined a ratio of the standard deviation to the absolute value of the mean across i's at each time period, t. However, CV could explode as mean EPS tends to zero, especially when analysts' EPS forecasts range from negative to positive values. Following common practice in finance literature (Zhang, 2006) to avoid this issue, I normalize the standard deviation by the prior year-end stock price. For the one-year ahead, normalized disagreement uncertainty measure for firm f is denoted as $DU_{f,t}$ by dropping h that is set to one year. Hence, $DU_{f,t}$ denotes the disagreement about one-year-ahead forecasts evaluated at t.

There are key features of the firm-level disagreement measure of uncertainty. First, it is worth noticing that the firm-level disagreement uncertainty can be constructed by setting a certain forecast horizon. This feature is unavailable for other text-based measure of uncertainty, such as the EPU index. Second, the DU index can be interpreted as the perceived uncertainty by professional financial market participants who regularly analyze firms' performances based on hard and soft information. Therefore, it also can be differentiated from the public perception of macro-level uncertainty (EPU). Third, comparing to a similar firm-level uncertainty index using the max-min range of the expectations on sales growth by firms' managers (Fiori and Scoccianti, 2023), the DU index utilizes the information about the subjective expectations of firms' profitability deduced by professionals who are outside of the company. Lastly, the ex-ante and forward looking aspect of the DU index derived by one-year-ahead forecasts establish a more natural and logical relationship

between the level of uncertainty at t and firms' real and financial activities one year ahead of t. In the previous studies that employ the measure of volatility in stock returns, the lagged values of uncertainty are often used in the empirical regression to address contemporaneous endogeneity and account for time to build delays (Alfaro et al., forthcoming). However, by construction, the DU index lagged by 1 year can be directly linked to the current period realizations of firms' investment and other real and financial outcomes.

Table 1 summarizes the descriptive statistics of firm-level disagreement uncertainty. By firm size, the majority of the observations are classified as large firms (96 percent). This is because the analysts' forecasts are available for larger firms of which stocks trading volumes are relatively high. Therefore, it is necessary to note that the empirical results based on the DU index mainly correspond to large firms. By industry, just over a half of the observations are in manufacturing sector, followed by information and communication technology sector and wholesale and retail sector.

To investigate the association bewteen the disagreement uncertainty measure and the EPU index, I aggregate the firm-level standard deviations across firms as follows.

$$DU_t = \sqrt{\sum_{f=1}^{F} DU_{f,t}^2} \tag{3}$$

By aggregating the firm-level disagreement uncertainty, Figure 1 shows the positive association between disagreement uncertainty and the EPU. Increases in DU precede increases in the EPU index by 5 quarters. Figure 2 suggests the countercyclicality of the disagreement uncertainty. Increases in one-year-ahead DU uncertainty lead up to decreases in the year-on-year GDP growth rate by 5 quarters.

3 Empirical strategy

To estimate the effects of firm-level uncertainty on investment, I rely on the following regression:

$$\Delta Inv_{f,t} = \theta_f + \mu_t + \alpha ln(DU_{f,t-4}) + X'_{f,t}\gamma + \varepsilon_{f,t}. \tag{4}$$

where $\Delta Inv_{f,t}$ is changes in investment in percentage, $ln(DU_{f,t-4})$ is natural log of firm-specific uncertainty index lagged by one year. θ_f is expected to capture firm fixed effects, μ_t is time fixed effects, and $X'_{f,t}$ is a vector of firm-level controls. To control for the firm-level first-moment shocks, I include Tobin's Q and for the financial constraints, I use return on asset (ROA), and the leverage ratio in the baseline model. The controls are in levels and one-year lagged. The selection of firm-level controls follows the existing literature (Leary and Roberts, 2014, Alfaro et al., forthcoming, among others).

To account for heterogeneity in the effects of firm-level uncertainty on investments, the interaction terms between the DU index and firm specific characteristics are included:

$$\Delta Inv_{f,t} = \theta_f + \mu_t + \alpha_0 ln(DU_{f,t-1}) + \alpha_1 FSC_f \times ln(DU_{f,t-1}) + X'_{f,t}\gamma + \varepsilon_{f,t} \tag{5}$$

where FSC_f is the value of firm specific characteristics. For FSC_f, investment irreversibility and various firm size variables are considered. All variables except employment are time-invariant as they use the firm-level sample averages or dummy variables. The sensibility of firms' investment to uncertainty depends on the degree of investment irreversibility (Gulen and Ion, 2016). I use the ratio of fixed assets (property, plant, and equipment, PPE) to total assets as a proxy, averaged over the entire sample period by firms. Firms' financing conditions are proxied by size of firms (Hadlock and Pierce, 2010). When deciding the level of investments, financially constrained firms may respond to uncertainty shocks differently than unconstrained firms. The first dummy for large corporations follows KIS value database categories which are based on the Framework Act on Small and Medium Enterprises. The second dummy for the 75 percentile and above is based on

the total asset, averaged across the sample period. Finally, the quarterly level of employment is also considered to account for the size of firms. Additionally, the firm-level controls and firm, year fixed effects are included as in the baseline model.

Next, the effects of uncertainty shock on other real and financial outcomes are examined. These include $\Delta ln(Debt_{f,t})$, $\Delta ln(Sales_{f,t})$, ***R&D investment ratio*** $(=$ ***R&D investment***$_{f,t}/Asset_{f,t-4})$, $\Delta Employment_{f,t}$, and ***Dividend ratio*** $(=$ ***Dividend***$_{f,t}/Asset_{f,t-4})$. The regressions include firm and quarter fixed effects and the firm-level controls are Tobin's Q, ROA, and the 4-factor z score which measures firm's bankruptcy risk.[3]

Firm balance sheet data comes from KISVALUE database by the Korea Investors Service. I include all listed firms and those delisted previously. Table 2 presents the summary statistics of all independent variables and controls.

4 Results

4.1 Baseline results

The empirical findings indicate that the real option channel of uncertainty shocks transmitted to firms' investment is in operation for South Korean firms. Table 3 reports the results. Following a 1 log point changes in the DU uncertainty index, investment growth tend to decrease by 0.09 to 0.16 percentage points, depending on four different specifications.

Table 4 shows the estimation results of the heterogeneous effect of firm-level uncertainty. The estimated coefficient on an interaction term between the time-invariant firm-level PPE ratio and the DU index lagged by 1 year is negative and statistically significant while the coefficient on the DU index becomes insignificant. The coefficients on two variables to capture the differential effects of uncertainty depending the size of firms, $ln(DU) \times Size(large)$ and $ln(DU) \times Size(75p)$, are positive but statistically insignificant. The findings suggest that there is no heterogeneity in the response of investment to uncertainty shocks across different levels of ex-ante financial constraints

[3]For a standard financial control, we use the z score, instead of leverage ratio as in main estimation model (Eq. 4). This is because some variables, such as debt, can be highly collinear with leverage ratio. I check the robustness by using alternative controls in Secion 4.2.

proxied by firm size. This could be the consequence of the sample selection. Since the analysts' forecasts are available mostly for large firms, the sample is heavily geared towards the right-tail of the Korean firms' distribution. Using an alternative proxy of employment level, the investment reduced to uncertainty shocks by less for the larger firms hiring more employees. This suggests that financial frictions for larger corporations are less of a concern in investment when facing heightened uncertainty.

Firms' financing decisions and other real activities are affected by the uncertainty shocks at the firm-level (Tables 5-9). Increases in the DU uncertainty reduce debt by 0.5-0.8 percent. The sales is estimated to be negatively associated with the DU uncertainty, ranging from 1.2 to 1.6 percent. The investment in R&D sector adversely responds to the firm-level uncertainty shocks, but with lower statistical significance of 0.15. The employment responses to disagreement uncertainty shocks is estimated to be -28 persons for a representative firm. The results in the dividend regressions indicate that when uncertainty is high, firms tend to increase their dividend ratio by 0.5 percentage points. This finding is consistent with the previous literature that provides empirical evidence of positive association of the economic policy uncertainty and firm-level dividends (for example,Attig et al., 2021). Instead of precautionary incentives that make firms to retain earnings in response of heightened uncertainty, increases in the agency costs of free cash flows during the times of high uncertainty can govern the managers' decision to payout larger dividend. That is, if the firm payout policy is driven by agency theory (La Porta et al., 2000), there is a possibility that managers may want to mitigate the agency problem between shareholders and creditors by adopting conservative dividend policy.

4.2 Robustness

Additional robustness analyses are conducted. First, the baseline investment models are estimated using two alternative subsamples–large firms only or manufacturing sector only. The empirical results (Tables 10-12) are consistent with the baseline. The impact of the DU uncertainty on investment is negative and statistically significant across various specifications.

Second, I use different firm-level controls for the baseline investment regressions. These include stock returns for the first-moment control, the leverage ratio and size (measured by employment) for financial controls. Table 12 reports the estimation results, largely consistent with the baseline but with lower statistical significance in some cases.

For the real and financial outcomes regression, I also check whether the findings are robust to different subsamples–large firms only or manufacturing sector only. Table 13-14 show that the results are similar to the baseline. The response of investment to the firm-level uncertainty shocks are negative irrespective of the specifications. The degree of the adverse response of investment is greater for the firms with higher fixed asset ratios.

Tables 15-16 presents the robustness results of firm-level real and financial outcomes with alternative controls. The firm-level controls include stock returns and employment. The estimated effects on real variables are negative as in the baseline. Increases in uncertainty is also associated with reductions in debt financing and increases in dividend payout.

5 Conclusions

This paper construct a novel measure for firm-level uncertainty using forecast disagreement among financial analysts in South Korea. I find that, at the aggregate level, the disagreement measure of uncertainty is associated with the Economic Policy Uncertainty (EPU) positively and precedes the EPU by 5 quarters. The DU index, uncertainty about one-year-ahead firm profitability, is negatively correlated with GDP growth with a 5-quarter lag.

To investigate the wait-and-see effect of uncertainty, the regressions of firm-level uncertainty on investment are estimated, controlling for firm-level first-moment shocks and financial conditions as well as firm and time fixed effects. The empirical results suggest that the firm-level disagreement measure of uncertainty adversely affects the investment. The findings corroborate that the effects of uncertainty is more pronounced for firms with high levels of irreversible investments. The negative effects of uncertainty on investment are less pronounced for financially less constrained firms when the firm size is proxied by employment levels. This supports the financial channel of

uncertainty impacts.

The estimated impacts on other real activities are consistent with the real option theory—sales, employment and investment in R&D are discouraged in response to uncertainty shocks. Firms' financial decisions are affected by uncertainty shocks. In particular, the results suggest that firms decrease debt and increase dividend when faced by higher uncertainty.

There are a number of gaps in the research that would benefit from further study. By extending the sample period to include the COVID-19 pandemic periods, the dynamics of the disagreement uncertainty can be investigated both at the firm-level and the aggregated level. Instrumental variables, such as exogenous firm-specific events, can be considered to address potential endogeneity bias.

References

[1] Alfaro, I., Bloom, N., and Lin, X. (forthcoming). The finance uncertainty multiplier. *Journal of Political Economy*.

[2] Arellano, C., Bai, Y., and Kehoe, P. J. (2019). Financial frictions and fluctuations in volatility. *Journal of Political Economy*, 127(5):2049–2103.

[3] Attig, N., El Ghoul, S., Guedhami, O., and Zheng, X. (2021). Dividends and economic policy uncertainty: International evidence. *Journal of Corporate Finance*, 66:101785.

[4] Bloom, N. (2014). Fluctuations in uncertainty. *Journal of economic Perspectives*, 28(2):153–176.

[5] Bloom, N., Bond, S., and Van Reenen, J. (2007). Uncertainty and investment dynamics. *The review of economic studies*, 74(2):391–415.

[6] Boero, G., Smith, J., and Wallis, K. F. (2015). The measurement and characteristics of professional forecasters' uncertainty. *Journal of Applied Econometrics*, 30(7):1029–1046.

[7] Dovern, J. (2015). A multivariate analysis of forecast disagreement: Confronting models of disagreement with survey data. *European Economic Review*, 80:16–35.

[8] Dovern, J. and Fritsche, U. (2008). Estimating fundamental cross-section dispersion from fixed event forecasts.

[9] Dovern, J., Fritsche, U., and Slacalek, J. (2012). Disagreement among forecasters in g7 countries. *Review of Economics and Statistics*, 94(4):1081–1096.

[10] Fiori, G. and Scoccianti, F. (2023). The economic effects of firm-level uncertainty: Evidence using subjective expectations. *Journal of Monetary Economics*, 140:92–105.

[11] Giordani, P. and Söderlind, P. (2003). Inflation forecast uncertainty. *European Economic Review*, 47(6):1037–1059.

[12] Glas, A. (2020). Five dimensions of the uncertainty–disagreement linkage. *International Journal of Forecasting*, 36(2):607–627.

[13] Gulen, H. and Ion, M. (2016). Policy uncertainty and corporate investment. *The Review of Financial Studies*, 29(3):523–564.

[14] Hadlock, C. J. and Pierce, J. R. (2010). New evidence on measuring financial constraints: Moving beyond the kz index. *The review of financial studies*, 23(5):1909–1940.

[15] Jurado, K., Ludvigson, S. C., and Ng, S. (2015). Measuring uncertainty. *American Economic Review*, 105(3):1177–1216.

[16] Kim, Y., Lee, S., and Lim, H. (2023). Uncertainty, credit and investment: Evidence from firm-bank matched data. *Journal of Banking & Finance*, 154:106974.

[17] La Porta, R., Lopez-de Silanes, F., Shleifer, A., and Vishny, R. W. (2000). Agency problems and dividend policies around the world. *The journal of finance*, 55(1):1–33.

[18] Lahiri, K. and Sheng, X. (2010). Measuring forecast uncertainty by disagreement: The missing link. *Journal of Applied Econometrics*, 25(4):514–538.

[19] Leahy, J. V. and Whited, T. M. (1996). The effect of uncertainty on investment: Some stylized facts. *Journal of Money, Credit and Banking*, 28(1):64–83.

[20] Leary, M. T. and Roberts, M. R. (2014). Do peer firms affect corporate financial policy? *The Journal of Finance*, 69(1):139–178.

[21] Panousi, V. and Papanikolaou, D. (2012). Investment, idiosyncratic risk, and ownership. *The Journal of finance*, 67(3):1113–1148.

[22] Rich, R. and Tracy, J. (2010). The relationships among expected inflation, disagreement, and uncertainty: evidence from matched point and density forecasts. *The Review of Economics and Statistics*, 92(1):200–207.

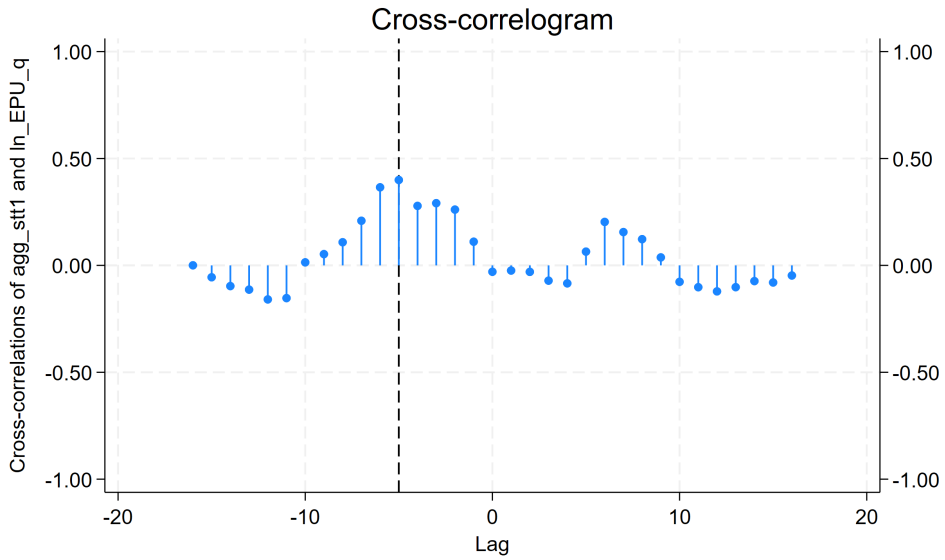
[23] Zhang, X. F. (2006). Information uncertainty and stock returns. *The journal of Finance*, 61(1):105–137.

TABLE 1 Summary Statistics: Disagreement Uncertainty

	Obs.	Mean	Median	SD	p25	p75
All	12,088	0.0139	0.0074	0.0330	0.0039	0.0140
By firm size						
Large	11,581	0.0140	0.0075	0.0335	0.0040	0.0140
Small and Medium	507	0.0122	0.0059	0.0216	0.0024	0.0137
By industry						
C	6,882	0.0146	0.0078	0.0385	0.0042	0.0145
D	220	0.0154	0.0142	0.0095	0.0084	0.0199
F	426	0.0209	0.0105	0.0343	0.0055	0.0200
G	1,025	0.0079	0.0054	0.0131	0.0033	0.0088
H	418	0.0304	0.0217	0.0362	0.0067	0.0391
I	30	0.0041	0.0034	0.0024	0.0025	0.0060
J	1,211	0.0084	0.0062	0.0127	0.0036	0.0097
M	1,359	0.0157	0.0084	0.0298	0.0042	0.0159
N	214	0.0043	0.0034	0.0035	0.0022	0.0052
P	77	0.0162	0.0055	0.0244	0.0031	0.0109
R	169	0.0069	0.0035	0.0169	0.0026	0.0056
S	57	0.0034	0.0023	0.0046	0.0013	0.0029

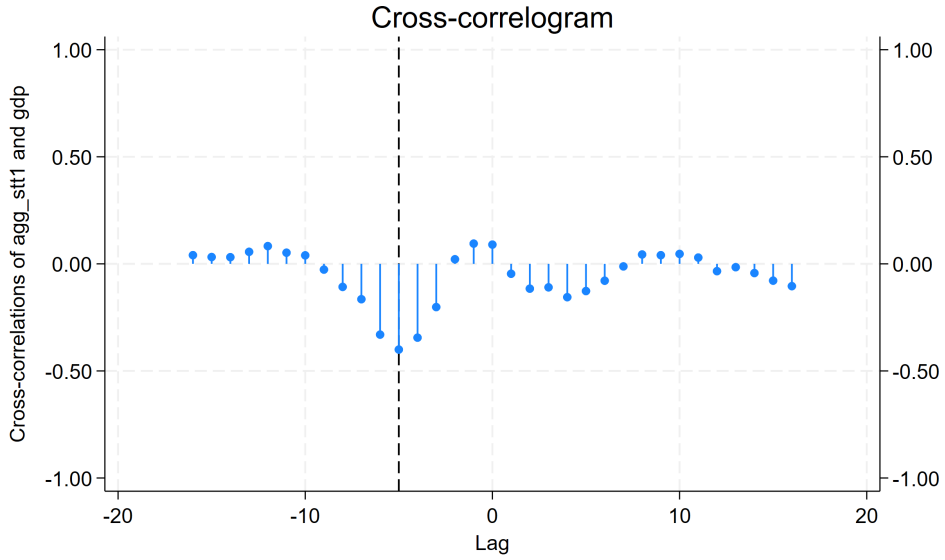
Notes: The industrial classification codes are as follows. C: Manufacturing; D: Electricity, gas, steam and air conditioning supply; F: Construction; G: Wholesale and retail trade; H: Transportation and storage; I: Accommodation and food service activities; J: Information and communication; M: Professional, scientific and technical activities; N: Business facilities management and business support services; rental and leasing activities; P: Education; R: Arts, sports and recreation related services; S: Membership organizations, repair and other personal services.

FIGURE 1 Cross correlation between aggregated disagreement uncertainty and EPU



Notes:

FIGURE 2 Cross correlation between aggregated disagreement uncertainty and GDP growth



Notes:

TABLE 2 Summary Statistics: Dependent variables and controls

	Obs.	Mean	Median	SD	p25	p75
Investment	12,088	0.647	0.111	3.768	-0.185	0.905
Debt	12,088	26.90	26.83	1.922	25.45	28.35
Sales	12,031	26.29	26.25	1.723	25.03	27.48
R&D investment	9,658	1.518	0.274	2.825	0	1.581
Employment	11,922	4.370	1.494	9.753	0.534	3.924
Dividend	9,246	-3.265	-2.436	7.785	-5.249	-0.494
Tobin's Q	12,088	1.732	1.322	1.343	0.992	1.938
Stock returns	12,067	0.00302	0.00314	0.131	-0.0697	0.0782
ROA	12,088	0.0171	0.0145	0.0263	0.00498	0.0275
Leverage	12,088	0.235	0.200	0.164	0.102	0.340
Z score	12,086	27.26	26.30	6.461	23.09	30.14

Notes: Investment is investment growth rate in percentage; debt and sales are in natural logs, R&D investment ratio is the ratio of R&D investment to total asset lagged by one year (in percent); employment is in 1,000 persons; dividend is calculated by Retained earnings$_{t-1}$-Retained earnings$_t$+Profit$_t$ and, to get the ratio (in percentage), divided by one-year lagged total asset.

TABLE 3 The effect of firm-level uncertainty on investment

	(1)	(2)	(3)	(4)
ln(DU)	-0.157***	-0.157***	-0.0875*	-0.0871*
	(0.0517)	(0.0518)	(0.0524)	(0.0525)
Tobin's Q			0.189**	0.189**
			(0.0950)	(0.0950)
ROA			4.764***	4.931***
			(1.795)	(1.830)
Leverage ratio			-2.152***	-2.152***
			(0.828)	(0.828)
Constant	-0.205	-0.185	0.228	0.279
	(0.254)	(0.271)	(0.422)	(0.430)
Observations	9,656	9,656	9,656	9,656
R-squared	0.001	0.001	0.007	0.008
Number of stock	381	381	381	381
Firm FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes

Notes: This table reports regression results of quarterly firm-level investment growth as expressed in percentage on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and leverage ratio, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 4 The heterogeneous effect of firm-level uncertainty on investment

	(1)	(2)	(3)	(4)
ln(DU)	0.139	-0.0916*	-0.0996*	-0.107*
	(0.0942)	(0.0533)	(0.0599)	(0.0596)
ln(DU) × PPE	-0.752**			
	(0.375)			
ln(DU) × Size (large)		0.171		
		(0.327)		
ln(DU) × Size(75p)			0.0562	
			(0.123)	
Employment				-0.0613***
				(0.0225)
ln(DU) × Employment				0.00390*
				(0.00211)
Tobin's Q	0.192**	0.189**	0.188**	0.186*
	(0.0950)	(0.0952)	(0.0951)	(0.0953)
ROA	4.956***	4.917***	4.935***	4.619**
	(1.810)	(1.827)	(1.835)	(1.856)
Leverage ratio	-2.123**	-2.140**	-2.188**	-2.102***
	(0.821)	(0.829)	(0.847)	(0.811)
Constant	0.281	0.280	0.300	0.557
	(0.424)	(0.430)	(0.437)	(0.479)
Observations	9,656	9,656	9,656	9,524
Number of stock	381	381	381	381
R-squared	0.008	0.008	0.008	0.009
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Notes: This table reports regression results of quarterly firm-level investment growth as expressed in percentage on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and leverage ratio, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 5 The effect of firm-level uncertainty on debt

	(1)	(2)	(3)	(4)
ln(DU)	-0.00819***	-0.00677**	-0.00639**	-0.00493*
	(0.00287)	(0.00284)	(0.00304)	(0.00299)
Tobin's Q			0.00735*	0.00732*
			(0.00403)	(0.00394)
ROA			-0.284**	-0.0964
			(0.119)	(0.115)
Z score			0.00425***	0.00373***
			(0.000979)	(0.000927)
Constant	-0.0253*	0.0411***	-0.140***	-0.0634**
	(0.0140)	(0.0152)	(0.0282)	(0.0257)
Observations	9,246	9,246	9,244	9,244
R-squared	0.001	0.035	0.007	0.039
Number of stock	372	372	372	372
Firm FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes

Notes: This table reports regression results of quarterly firm-level debt growth as expressed in changes in the natural logarithm on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and Z score, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 6 The effect of firm-level uncertainty on sales

	(1)	(2)	(3)	(4)
ln(DU)	-0.0123***	-0.0128***	-0.0152***	-0.0160***
	(0.00473)	(0.00467)	(0.00457)	(0.00454)
Tobin's Q			0.000773	0.00113
			(0.00433)	(0.00440)
ROA			-1.063***	-1.141***
			(0.379)	(0.375)
Z score			-0.00255	-0.00254
			(0.00278)	(0.00273)
Constant	-0.0535**	-0.0758***	0.0188	-0.0101
	(0.0232)	(0.0255)	(0.0807)	(0.0770)
Observations	9,198	9,198	9,196	9,196
R-squared	0.001	0.003	0.007	0.010
Number of stock	372	372	372	372
Firm FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes

Notes: This table reports regression results of quarterly firm-level sales growth as expressed in changes in the natural logarithm on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and Z score, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 7 The effect of firm-level uncertainty on R&D investment ratio

	(1)	(2)	(3)	(4)
ln(DU)	-0.0571^{y}	-0.0563^{y}	-0.0518^{y}	-0.0508^{y}
	(0.0361)	(0.0361)	(0.0352)	(0.0352)
Tobin's Q			-0.00566	-0.00681
			(0.0286)	(0.0286)
ROA			-1.611*	-1.424
			(0.945)	(0.951)
Z score			0.0181*	0.0187*
			(0.0107)	(0.0108)
Constant	1.238***	1.312***	0.808**	0.858***
	(0.177)	(0.179)	(0.326)	(0.328)
Observations	9,656	9,656	9,654	9,654
R-squared	0.002	0.004	0.006	0.008
Number of stock	381	381	381	381
Firm FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes

Notes: This table reports regression results of quarterly firm-level R&D investment ratio as expressed in percentage on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and Z score, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, y $p < 0.15$.

TABLE 8 The effect of firm-level uncertainty on employment

	(1)	(2)	(3)	(4)
ln(DU)	-0.0289*	-0.0287*	-0.0279*	-0.0276*
	(0.0151)	(0.0150)	(0.0152)	(0.0152)
Tobin's Q			0.00744**	0.00715*
			(0.00374)	(0.00374)
ROA			0.339	0.386*
			(0.213)	(0.226)
Z score			-0.000657	-0.000595
			(0.00182)	(0.00189)
Constant	-0.116	-0.104	-0.112*	-0.0995
	(0.0739)	(0.0732)	(0.0677)	(0.0676)
Observations	8,999	8,999	8,997	8,997
R-squared	0.001	0.002	0.002	0.002
Number of stock	372	372	372	372
Firm FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes

Notes: This table reports regression results of quarterly firm-level employment changes as expressed in 1,000 persons on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and Z score, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 9 The effect of firm-level uncertainty on dividend

	(1)	(2)	(3)	(4)
ln(DU)	0.488***	0.490***	0.502***	0.500***
	(0.136)	(0.135)	(0.132)	(0.132)
Tobin's Q			-0.710***	-0.694***
			(0.202)	(0.201)
ROA			-8.200*	-6.915
			(4.835)	(4.775)
Z score			0.282***	0.271***
			(0.0432)	(0.0431)
Constant	-0.875	-0.496	-7.097***	-6.552***
	(0.664)	(0.656)	(1.309)	(1.317)
Observations	9,245	9,245	9,244	9,244
R-squared	0.002	0.014	0.022	0.032
Number of stock	372	372	372	372
Firm FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes

Notes: This table reports regression results of quarterly firm-level dividend ratio as expressed in percentage on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and Z score, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 10 The effect of firm-level uncertainty on investment: large firms

	(1)	(2)	(3)	(4)	(5)
ln(DU)	-0.163***	-0.164***	-0.0900*	-0.0898*	0.128
	(0.0524)	(0.0524)	(0.0532)	(0.0533)	(0.0957)
ln(DU) × PPE					-0.723*
					(0.383)
Tobin's Q			0.221**	0.221**	0.225**
			(0.110)	(0.110)	(0.109)
ROA			4.857***	4.986***	5.014***
			(1.835)	(1.866)	(1.847)
Leverage ratio			-2.065**	-2.064**	-2.032**
			(0.856)	(0.856)	(0.849)
Constant	-0.243	-0.237	0.155	0.193	0.188
	(0.256)	(0.274)	(0.447)	(0.454)	(0.449)
Observations	9,380	9,380	9,380	9,380	9,380
R-squared	0.001	0.001	0.008	0.008	0.009
Number of stock	346	346	346	346	346
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	Yes

Notes: This table reports regression results of quarterly firm-level investment growth as expressed in percentage on one-year-lagged disagreement uncertainty as express in the natural logarithm. The sample is restricted to include only large firms defined as in the Framework Act on Small and Medium Enterprises. Firm level controls include Tobin's Q, ROA and leverage ratio, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 11 The effect of firm-level uncertainty on investment: manufacturing

	(1)	(2)	(3)	(4)	(5)
ln(DU)	-0.175***	-0.175***	-0.115*	-0.113*	0.254
	(0.0641)	(0.0641)	(0.0637)	(0.0637)	(0.156)
ln(DU) × PPE					-1.106**
					(0.544)
Tobin's Q			0.350***	0.352***	0.354***
			(0.128)	(0.128)	(0.129)
ROA			7.724***	7.592***	7.531***
			(2.315)	(2.240)	(2.204)
Leverage ratio			-1.534	-1.521	-1.511
			(1.195)	(1.200)	(1.194)
Constant	-0.202	-0.258	-0.291	-0.306	-0.270
	(0.311)	(0.328)	(0.512)	(0.509)	(0.495)
Observations	5,389	5,389	5,389	5,389	5,389
R-squared	0.002	0.002	0.014	0.014	0.015
Number of stock	229	229	229	229	229
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	Yes

Notes: This table reports regression results of quarterly firm-level investment growth as expressed in percentage on one-year-lagged disagreement uncertainty as express in the natural logarithm. The sample is restricted to include only firms in manufacturing sector. Firm level controls include Tobin's Q, ROA and leverage ratio, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 12 The effect of firm-level uncertainty on investment: different firm-level controls

	(1)	(2)	(3)	(4)	(5)
ln(DU)	-0.0809^{y}	-0.0769^{y}	-0.110**	-0.106**	-0.103**
	(0.0548)	(0.0509)	(0.0492)	(0.0484)	(0.0512)
Tobin's Q	0.186*		0.285***	0.253***	0.250***
	(0.0952)		(0.0887)	(0.0904)	(0.0907)
ROA	4.613**	5.571***		5.267***	4.982***
	(1.849)	(1.848)		(1.857)	(1.879)
Leverage ratio	-2.130***	-2.737***			
	(0.818)	(0.716)			
Size	-0.0664**				-0.0543***
	(0.0269)				(0.0202)
Return		0.436	0.410	0.376	0.385
		(0.381)	(0.382)	(0.380)	(0.382)
Constant	0.635	0.790**	-0.447	-0.440	-0.150
	(0.483)	(0.356)	(0.284)	(0.282)	(0.318)
Observations	9,524	9,636	9,636	9,636	9,504
R-squared	0.009	0.006	0.005	0.006	0.007
Number of stock	381	381	381	381	381
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Notes: This table reports regression results of quarterly firm-level investment growth as expressed in percentage on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and leverage ratio, firm size, stock returns, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, y $p < 0.15$.

TABLE 13 The effect of firm-level uncertainty on real and financial variables: large firms

	(1) $\Delta \ln(Debt)$	(2) $\Delta \ln(Sales)$	(3) *R&D investment*	(4) $\Delta Employment$	(5) *Dividend*
ln(DU)	-0.00456^{y}	-0.0147***	-0.0588^{y}	-0.0279*	0.506***
	(0.00298)	(0.00452)	(0.0358)	(0.0155)	(0.134)
Tobin's Q	0.00549	0.00361	0.00451	0.00854**	-0.818***
	(0.00350)	(0.00478)	(0.0295)	(0.00432)	(0.218)
ROA	-0.0947	-1.109***	-1.359	0.383*	-6.865
	(0.116)	(0.376)	(0.969)	(0.231)	(4.835)
Z score	0.00338***	-0.00279	0.0173	-0.000638	0.281***
	(0.000884)	(0.00284)	(0.0112)	(0.00197)	(0.0445)
Constant	-0.0498**	-0.000562	0.789**	-0.101	-6.571***
	(0.0244)	(0.0794)	(0.337)	(0.0687)	(1.350)
Observations	8,997	8,951	9,378	8,756	8,997
R-squared	0.039	0.009	0.008	0.002	0.034
Number of stock	337	337	346	337	337
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Notes: This table reports regression results of quarterly firm-level real and financial variables on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and Z score, all lagged by one year. The sample is restricted to include only large firms defined as in the Framework Act on Small and Medium Enterprises. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, y $p < 0.15$.

TABLE 14 The effect of firm-level uncertainty on real and financial variables: manufacturing

	(1) $\Delta \ln(Debt)$	(2) $\Delta \ln(Sales)$	(3) *R&D investment*	(4) $\Delta Employment$	(5) *Dividend*
ln(DU)	-0.00711**	-0.0178***	-0.0893^{y}	-0.0422*	0.505***
	(0.00343)	(0.00579)	(0.0576)	(0.0247)	(0.152)
Tobin's Q	0.00835*	0.00305	-0.0454	0.0160**	-0.541***
	(0.00473)	(0.00536)	(0.0512)	(0.00742)	(0.152)
ROA	-0.304*	-1.154***	-1.177	0.508	-7.711
	(0.171)	(0.406)	(1.809)	(0.436)	(9.399)
Z score	0.00275**	-0.00167	0.0217	-0.00125	0.344***
	(0.00112)	(0.00335)	(0.0137)	(0.00300)	(0.0610)
Constant	-0.0459	-0.0526	1.242***	-0.157	-9.117***
	(0.0331)	(0.0948)	(0.477)	(0.111)	(1.652)
Observations	5,127	5,109	5,387	5,010	5,127
R-squared	0.052	0.015	0.012	0.003	0.064
Number of stock	222	222	229	222	222
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Notes: This table reports regression results of quarterly firm-level real and financial variables on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, ROA and Z score, all lagged by one year. Firm level controls include Tobin's Q, ROA and leverage ratio, all lagged by one year. The sample is restricted to include only firms in manufacturing sector. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, y $p < 0.15$.

TABLE 15 The effect of firm-level uncertainty on real and financial activities: different firm-level controls (I)

	(1) $\Delta \ln(Debt)$	(2) $\Delta \ln(Debt)$	(3) $\Delta \ln(Sales)$	(4) $\Delta \ln(Sales)$	(5) *R&D investment*	(6) *R&D investment*
ln(DU)	-0.00559*	-0.00542*	-0.0122**	-0.0118**	-0.0672*	-0.0658*
	(0.00295)	(0.00288)	(0.00497)	(0.00500)	(0.0350)	(0.0355)
Tobin's Q	0.00897**	0.00887**	0.000830	0.000126	-0.00531	-0.00490
	(0.00386)	(0.00390)	(0.00433)	(0.00436)	(0.0283)	(0.0287)
Return		0.0183		0.0361		0.0366
		(0.0234)		(0.0273)		(0.105)
ROA	-0.0961	-0.108	-1.371***	-1.391***	-0.511	-0.501
	(0.117)	(0.118)	(0.407)	(0.414)	(0.951)	(0.950)
Employment	-0.00112	-0.000943	-0.00351*	-0.00318*	0.0383	0.0390*
	(0.00113)	(0.00109)	(0.00198)	(0.00191)	(0.0251)	(0.0233)
Constant	0.0381**	0.0385**	-0.0389	-0.0371	1.089***	1.092***
	(0.0175)	(0.0171)	(0.0280)	(0.0284)	(0.244)	(0.244)
Observations	9,119	9,099	9,072	9,052	9,524	9,504
R-squared	0.036	0.037	0.012	0.012	0.010	0.010
Number of stock	372	372	372	372	381	381
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports regression results of quarterly firm-level real and financial variables on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, stock returns, ROA and firm size measured by employment, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

TABLE 16 The effect of firm-level uncertainty on real and financial activities: different firm-level controls (II)

	(1) $\Delta Employment$	(2) $\Delta Employment$	(3) *Dividend*	(4) *Dividend*
ln(DU)	-0.0273*	-0.0261*	0.357***	0.334**
	(0.0149)	(0.0151)	(0.138)	(0.137)
Tobin's Q	0.00709**	0.00744**	-0.603***	-0.574**
	(0.00352)	(0.00350)	(0.228)	(0.231)
Return		0.0537		-2.321***
		(0.0330)		(0.564)
ROA	0.347*	0.309	-2.986	-1.748
	(0.206)	(0.204)	(5.375)	(5.243)
Employment			0.213***	0.212***
			(0.0577)	(0.0569)
Constant	-0.114	-0.108	-1.137	-1.320*
	(0.0726)	(0.0734)	(0.787)	(0.780)
Observations	8,999	8,979	9,118	9,098
R-squared	0.002	0.002	0.021	0.022
Number of stock	372	372	372	372
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

Notes: This table reports regression results of quarterly firm-level real and financial variables on one-year-lagged disagreement uncertainty as express in the natural logarithm. Firm level controls include Tobin's Q, stock returns, ROA and firm size measured by employment, all lagged by one year. The sample period is from 2013Q1 to 2019Q4. Standard errors are clustered by the firm levels and are reported in parentheses. Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.