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The News Media and the Expectation Formation of Firms

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The News Media and the Expectation Formation of Firms

Preliminary Version

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Abstract

Forming expectations about the future path of the economy and the own business prospects is not costless for a firm. Instead, acquiring and processing the relevant macroeconomic information requires valuable resources. Thus, many firms rely on the coding services provided by the mass media. We investigate empirically whether the news media have an independent influence on the expectation formation process of firms that goes beyond the actual economic developments. Using the Ifo survey data that explicitly measure business expectations, as well as data that cover the intensity and the tone of media coverage, we come to three conclusions. First, a firm is more likely to update its business expectations when the volume of macroeconomic news increases. Second, the news media act as an amplifier of actual economic developments, at least in a negative macroeconomic environment. Third, firms react stronger to negative reports than to positive reports.

Keywords: Business expectations, media reporting, news, information costs, survey data.

1 Introduction

The working horse of economics has long been the hypothesis of rational expectations originally proposed by Muth (1961) and promoted by Lucas (1972, 1976). According to the rational expectations hypothesis individuals are not only forward-looking and have knowledge of the true model for the future path of the economy, but they also update their expectations continuously by constantly feeding all relevant data into the forecasting model. In reality, however, economic agents face information costs in their process of expectation formation; they have to spend money and time to obtain and evaluate all the available information. Costs of information acquisition and processing lie at the heart of the sticky information model by Mankiw and Reis (2002, 2006), arguably the most prominent deviation from the rational expectations hypothesis. The authors suggest that macroeconomic aggregates react gradually to shocks because individuals only sporadically update their expectations and thus, new information disseminates slowly throughout the economy.

In his rational inattention model, which provides a microfoundation of the sticky information model, Sims (2003) sheds light on the role that the mass media play in the economic agents' expectation formation process. The latter are assumed to have limited capacities of information processing, so they receive an erratic signal of a macroeconomic shock. But the idiosyncratic coding errors only have an aggregate effect and do not average out because individuals rely largely on the coding services provided by the news media. Carroll (2003) models the impact of the mass media on macroeconomic expectations more explicitly. He develops an epidemiologic model of expectations according to which macroeconomic information spreads across an economy like an epidemic with the mass media being the common source of infection. He shows that the rate of infection depends on the intensity of news coverage. So the higher the number of reports about inflation, for instance, the larger the fraction of households that adapt their inflation expectations in a given period.

While Carroll (2003) has initiated a strand of literature dealing with the

impact of economic news on the macroeconomic expectations of households and professional forecasters (Curtin, 2003; Badarinza and Buchmann, 2009; Easaw and Ghoshray, 2010; Lamla and Maag, 2012), we are the first to analyse on the micro level whether macroeconomic news also affect the business expectations of firms. Is a firm more likely to update its business expectations when media coverage is more intense? Do the news media merely mirror the economic situation or do they act as an amplifier of actual developments? And finally, does the media tenor have an impact on the expectation formation process of firms? The remainder of this paper is organised as follows. Section 2 describes the data, the econometric model as well as the results and Section 3 concludes.

2 Empirical Analysis

2.1 Data

The dataset consists of monthly data from 01/1998 to 05/2011, which we have retrieved from three sources: the business survey compiled by the Ifo Institute,¹ media data from the media research institute Mediatenor, and macroeconomic data from Datastream as well as the German Bundesbank. The Ifo business survey panel used here comprises 7190 product groups within the manufacturing sector.² One of the main advantages of this survey is that it asks directly for business expectations: *“With respect to the business cycle, our situation for product group XY is expected to be somewhat better, more or less the same, or somewhat worse in the next six months.”* These three possible answers are recoded into 1 when the firm expects a changed business situation as compared to the current situation (*“better”* or *“worse”*) and 0 if it does not (*“same”*). This is interpreted as an update of expectations (EXPECTATIONS UPDATE), not over time, but between two states—with and without the incorporation of new information.

¹For details on the Ifo Business Survey see Becker and Wohlrabe (2008).

²For the sake of convenience, the product groups will be referred to as firms in the following, although they correspond to only around 4500 firms.

Table 1: Transition probabilities

Business expectations	Business expectations			Total
	better	same	worse	
better	60.01	36.03	3.97	100
same	10.36	79.37	10.27	100
worse	4.97	34.06	60.98	100
Total	18.64	62.96	18.40	100

It would be desirable to examine the firms' expectation updating behaviour over time, however, there are limitations to the data. Firstly, the relevant variables are categorical. Interpreting an answer series of, say, "same" and "worse" as a change of expectations is problematic, since the meaning of a firm's response depends on the state of the economy during and before the time the questionnaire is answered. Secondly, the data is highly time-dependent, so there is not much within-variance. Table 1 shows the transition probabilities for the change in the business expectations over time. In particular, 80% of the firms that report unchanged business expectations in one month give the same answer in the following month, and with 63% this category constitutes the bulk of responses. So the underlying assumption we take to interpret the business expectations variable as an update of expectations is that without the incorporation of new information, firms expect their business situation to remain unchanged.

The business survey panel also contains detailed firm-specific information that is used as control variables because the macroeconomic situation can be reflected in the situation of the firm: the state of business (STATE), production versus previous two to three months (PRODUCTION), demand versus previous months (DEMAND), orders on hand (ORDERS), orders versus previous months (ORDVPM), domestic selling prices versus previous months (PRICES), and the number of employees (EMPL).

The second data source is the media research institute Mediatenor, which analyses all economic news in a range of print and TV sources³ of at least

³We used the following sources. Newspapers: Welt, Frankfurter Allgemeine Zeitung, Süddeutsche Zeitung, Frankfurter Rundschau, Bild, Bild am Sonntag; Magazines: Focus, Spiegel, ManagerMagazin, Wirtschaftswoche; Television broadcasts: ARD Tagesthemen, ARD Tagesschau, ZDF heute, ZDF heute journal, RTL aktuell, Sat.1 18:30, Pro Sieben

five lines or five seconds, respectively. To increase accuracy, the news are coded by analysts, not by a computer algorithm. Our sample covers news about the current and future cyclical developments in Germany and its most important export countries.⁴ The news reports fall into the following categories: Economic climate, GDP and its components, Euro exchange rate, competitiveness, productivity, (un-)employment, labour costs, consumer confidence, insolvencies, start-ups, capital resources and bank lending, and future prospects.⁵ To make sure that we capture news that could potentially influence the expectations as reported in the Ifo business survey, we only use those reports published between the first and the 20th day of each month, which is the period during which the firms fill out the questionnaires.⁶ Moreover, we skip all news of the category “business sentiment” because they mainly consist of reports about the Ifo business tendency indicators, which are computed from the survey data and are well-known cyclical indicators. Thereby, we circumvent the problem of reverse causality between business expectations and media coverage. From the media data, we construct two news indexes. The first one is a news volume index, which counts all news per month. The second one is a news tone index, which is a balance index of the proportion of positive and negative news per month.

Finally, we need to control for macroeconomic information since the intensity and the tone of media coverage are not exogenous, but depend on

Newstime, Fakt (MDR), Frontal 21 (ZDF), Kontraste (SFB), Monitor (WDR), Panorama (NDR), Plusminus (ARD), Report (BR), WISO (ZDF) and Berlin direkt (ZDF).

⁴In 2012, the ten most important export countries for Germany were the following. France, USA, UK, the Netherlands, China, Austria, Italy, Switzerland, Belgium and Poland. We also include reports about the business cycle in the EU as well as the eurozone.

⁵In fact, fiscal and monetary policy also influence business expectations. However, it is unclear according to which criteria media reports evaluate economic policy and which role business cycle considerations play hereby. Thus, reports on economic policy in general, on its instruments such as taxes, subsidies and the interest rate, and on its consequences like inflation and public debt are excluded in the baseline specification. However, robustness checks including them are performed and the results hold.

⁶However, there is a tendency among the firms to respond early, so that news that are disseminated later in the month do not play a role in the expectation formation of the majority of firms; 75% of those who responded online (a means chosen by around 52% of the respondents) send back the questionnaire until the 14th day of the month. Thus, as a robustness check, we calculated all media indices using only those media reports published between the first and the 14th day of each month, and the results remain unchanged.

the country's current economic situation and its economic outlook. To proxy the present state of the economy we use the monthly and the yearly growth rates of industrial production (IPMOM and IPYOY), as well as one lag of the monthly growth rate (IPMOM(-1)). We take real time data to imitate the information set as available to the firms in the given month.⁷ To capture expectations regarding future economic developments, we employ the monthly change in the Consensus GDP forecast (CONSENSUS). Additionally, the monthly percentage change in the DAX index mirrors all other relevant macroeconomic information, and the VDAX as a volatility index measures the pertinence of the macroeconomic situation.⁸

Table 2: Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Dependent variables					
EXPECTATIONS UPDATE	0.371	0.483	0	1	434067
EXPECTATIONS UP	0.187	0.39	0	1	434067
EXPECTATIONS DOWN	0.184	0.387	0	1	434067
News indexes					
NEWSVOL	60.432	32.756	9	165	434706
NEWSTONE	-17.829	30.74	-82.759	43.284	434706
Macroeconomic data					
IPMOM	0.027	1.907	-8.391	5.096	434706
IPMOM(-1)	0.17	1.823	-7.009	5.21	434706
IPYOY	2.044	7.032	-24.099	15.139	434706
DAX	0.629	6.91	-26.847	18.476	434706
VDAX	26.265	9.98	12.98	64.370	434706
CONSENSUS	1.34	1.799	-5.9	3.6	434706
Firm data					
STATE	-0.037	0.675	-1	1	434706
PRODUCTION	-0.056	0.595	-1	1	434706
DEMAND	-0.014	0.645	-1	1	434706
ORDERS	-0.269	0.636	-1	1	434706
ORDVPM	-0.069	0.64	-1	1	434706
PRICES	0.003	0.428	-1	1	434706
EMPL	484.297	3463.453	0	900079	434706

Table 2 reports the summary statistics. It can be seen that the probability

⁷The data are retrieved from http://www.bundesbank.de/statistik/statistik_realtime.php

⁸Since we only use the media data until the 20th of the month, the monthly percentage change of the DAX is calculated from the 20th of the current month compared to the 20th of the previous month, and the VDAX is the average of that same period.

that a firm updates its expectations (EXPECTATIONS UPDATE) is 37%, and that it is approximately as likely that the firm changes its expectations upwards (EXPECTATIONS UP) as downwards (EXPECTATIONS DOWN). The average number of news reports per month (NEWSVOL) is around 60 and varies between 9 and 165. These numbers might appear rather low, but this is due to the fact that only some of the sources are available for the whole time span.⁹ The news tone index (NEWSTONE), which by construction can vary between -100 and 100 balance points, has a negative bias of roughly -18.¹⁰

Figure 1: News indexes

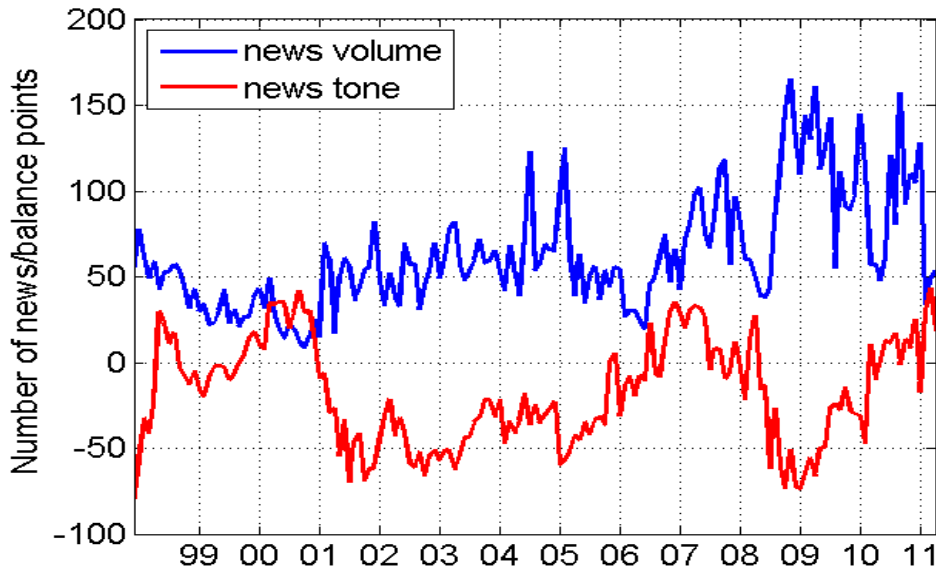


Figure 1 displays both news indexes from 1998 to mid 2011. The news tone index quite nicely captures the beginning of the recessions in 2001 and in 2008. Furthermore, there is a negative relationship between news tone and news volume; a higher number of reports tends to be driven by a larger

⁹This is only the case for the following magazines and television broadcasts: ARD Tagesthemen, ARD Tagesschau, ZDF heute journal, ZDF heute, RTL aktuell, SAT.1 18:30, Focus, and Spiegel.

¹⁰The negative bias also holds when the recent financial economic crisis is excluded from the sample.

number of negative news.

2.2 Econometric Models

In the baseline specification we estimate two linear probability models with firm fixed effects and cluster-robust standard errors. With the first model, we analyse whether business expectations are influenced by the volume of news reports at all and whether the latter reinforces the impact of economic developments on business expectations. The idea is that the more the economic situation changes—either in a good or in a bad way—this becomes more noteworthy, so the volume of reports increases. Businesses become “infected” by the media reports about the macroeconomic situation and adapt their expectations by more than what the pure data suggest. To capture the extent to which the macroeconomic situation changes we compute the absolute deviation (a.d.) of the macroeconomic variables from their means and extract a common factor (ECON) by principal components analysis.¹¹ Then, we interact this new variable with news volume (INTECON) since entering several interaction terms with the single macroeconomic variables into the model creates problems of multicollinearity.¹² The interaction term is the reason why we estimate a linear probability model instead of a logit or probit model; in nonlinear models, interaction terms are difficult to interpret (Ai and Norton, 2003). Moreover, marginal effects cannot be identified in nonlinear panel models. So another advantage of the linear model is that we can exploit the panel structure of the data and estimate firm-specific fixed effects (c_i). They are of minor importance here as they are time-invariant, and thus cannot be correlated with the variables of interest, which only vary over time. However, there can be an indirect relationship through the correlation with the firm-specific variables \mathbf{FIRM}_{it} , where $\mathbf{FIRM}'_{it} =$

¹¹The first common factor is the linear combination, which explains the largest part of the variance in the data.

¹²We checked the results when entering one such interaction term at a time and they are robust.

(STATE_{it}, PRODUCTION_{it}, ORDERS_{it}, ORDVPM_{it}, PRICES_{it}, EMPL_{it}):¹³

$$y_{it} = \alpha + \beta_1 \text{NEWSVOL}_t + \beta_2 \text{ECON}_t + \beta_3 (\text{NEWSVOL}_t \times \text{ECON}_t) \quad (1) \\ + \beta'_4 \mathbf{FIRM}_{it} + c_i + u_{it},$$

where

$$y_{it} = \begin{cases} 1, & \text{if expectations updated} \\ 0, & \text{if expectations unchanged.} \end{cases}$$

With the second model, we estimate the impact of the news tone on business expectations. Here, we skip the interaction term because it would be difficult to interpret.¹⁴ Thus, it is not necessary to use a common factor, but the macroeconomic variables enter the model separately and untransformed:

$$y_{it} = \alpha + \beta_1 \text{NEWSTONE}_t + \beta_2 \text{IPMOM}_t + \beta_3 \text{IPMOM}(-1)_t \quad (2) \\ + \beta_4 \text{IPYOY}_t + \beta_5 \text{DAX}_t + \beta_6 \text{VDAX}_t + \beta_7 \text{CONSENSUS}_t \\ + \beta'_8 \mathbf{FIRM}_{it} + c_i + u_{it}.$$

2.3 Results

Table 3 reports the results (in percentage points) of the first model, which captures the effect of news volume on business expectations. When the volume of business cycle news rises, there is a highly significant positive effect on the probability that a firm updates its business expectations. The effect is moderate; for the average value of ECON, the probability of an expectations update rises by 0.02 percentage points, when there is one more news report per month (Equation (6)). But the more important the changes in the macroeconomic situation, the stronger is the influence of media coverage on the expectation formation process of firms; the interaction term has

¹³In this model all firm variables except EMPL_{it} enter as dummy variables, which take value 1 if the situation is declared to have changed, and 0 otherwise. This transformation of categorical variables is the counterpart to the transformation of the (continuous) macroeconomic variables.

¹⁴All models without interaction terms are also estimated as pooled logit models with cluster-robust standard errors and the results are very similar.

a positive sign and is also highly significant. Equations (2) and (5) were estimated to check whether using the common factor or the macroeconomic variables separately makes a difference compared to Equations (3) and (6), respectively, but the coefficient of NEWSVOL remains very similar.

Table 3: Effects of news volume

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Expectations update</i>						
NEWSVOL	0.09*** (0.00)	0.05*** (0.00)	0.06*** (0.00)	0.03*** (0.00)	0.04*** (0.00)	0.02*** (0.01)
IPMOM (a.d.)		0.77*** (0.07)			0.60*** (0.06)	
IPMOM(-1) (a.d.)		1.08*** (0.06)			0.87*** (0.06)	
IPYOY (a.d.)		0.36*** (0.03)			0.12*** (0.04)	
DAX (a.d.)		0.18*** (0.02)			0.15*** (0.02)	
VDAX (a.d.)		0.14*** (0.01)			0.11*** (0.02)	
CONSENSUS (a.d.)		-0.64*** (0.10)			-0.34*** (0.11)	
ECON (a.d.)			2.07*** (0.09)	-0.44* (0.24)		-0.46* (0.25)
INTECON				0.03*** (0.00)		0.02*** (0.00)
CONSTANT	31.51*** (0.13)	28.32*** (0.19)	31.32*** (0.16)	33.89*** (0.26)	15.35*** (0.34)	19.24*** (0.42)
FIRM CONTROLS (d)	No	No	No	No	Yes	Yes
FIXED EFFECTS	No	No	No	No	Yes	Yes
Observations	434067	434067	434067	434067	434067	434067
Adj. R2	0.004	0.007	0.005	0.006	0.071	0.070

Notes: Results in percentage points, * p<0.10, ** p<0.05, *** p<0.01, robust standard errors in parentheses, a.d. - absolute deviation from the mean, d - dummy variables.

Table 4 shows why the volume effect of media coverage might be rather small. It reports the results of the second model, which we estimate to find out whether the tone of media coverage plays a role when firms are forming their expectations. In fact, businesses react differently to positive and to negative news. The negative sign of NEWSTONE means that the

Table 4: Effects of news tone

	(1)	(2)	(3)
<i>Dependent variable: Expectations update</i>			
NEWSTONE	-0.12*** (0.00)	-0.06*** (0.00)	-0.04*** (0.00)
IPMOM		-0.52*** (0.04)	-0.42*** (0.05)
IPMOM(-1)		-0.52*** (0.05)	-0.42*** (0.04)
IPYOY		0.15*** (0.03)	0.15*** (0.04)
DAX		0.07*** (0.01)	0.06*** (0.01)
VDAX		0.17*** (0.01)	0.15*** (0.01)
CONSENSUS		-1.58*** (0.11)	-0.82*** (0.15)
CONSTANT	34.96*** (0.08)	33.35*** (0.29)	32.11*** (0.42)
FIRM CONTROLS	No	No	Yes
FIXED EFFECTS	No	No	Yes
Observations	434067	434067	434067
Adj. R2	0.006	0.009	0.023

Notes: Results in percentage points, * p<0.10, ** p<0.05, *** p<0.01, robust standard errors in parentheses.

probability of an expectations update declines when the tone of the news reports becomes more favourable. Put differently, firms are more likely to update their expectations, when the fraction of negative news becomes larger. This effect is also highly significant and remains even when controlling for the macroeconomic situation and firm-specific information (Equations (2) and (3)).

To test consistency of the expectations updates, we estimate separate models for the effect of positive and negative news reports (NEWSPOS and NEWSNEG) on the probability of an expectations update upwards or downwards, respectively. We do not use the business expectations variable as categorical variable with the values -1, 0 and 1, because an expectation update upwards and downwards could follow different data-generating processes.

NEWSPOS and NEWSNEG are volume measures, which contain the number of positive and negative news, respectively, so we include interaction terms analogously to the econometric model 1. But here, the common factors are transformed to dummy variables (ECONPOS and ECONNEG), which take value 1 when the factor has a larger (smaller) value than its mean, indicating a positive (negative) macroeconomic environment. The results are displayed in the Appendix. In both Tables 5 and 6 the signs of the news measures are positive. Thus, the reactions of the firms are consistent; they tend to adapt more favourable (unfavourable) business expectations when the number of positive (negative) news increases. The coefficient of NEWSPOS is four times as large as the coefficient of NEWSNEG. But they capture the effect of positive news in a negative macroeconomic environment and the effect of negative news in a positive environment, respectively. Additionally, while the interaction term between the macroeconomic situation and the number of favourable news (INTECONPOS) has a positive sign, the corresponding interaction term with the volume of unfavourable news (INTECONNEG) has a negative coefficient. Taken together, a positive macroeconomic situation dampens the effect of media coverage, while a negative environment reinforces it. This is the counterpart to the results obtained in Table 4; not only do firms react stronger to negative than to positive news reports, they are also more susceptible to business cycle news (positive as well as negative reports), when the macroeconomic situation is below average.

As a robustness check, we make sure that the results are not merely driven by the recent economic crisis and also apply to “normal” times. Therefore, we estimate the four models from above for a subsample from 01/1998 to 08/2008, so the period before the Lehman collapse. For the shorter period, the volume effect is insignificant because there are more positive news, but all other results hold. Finally, we also estimate the baseline models with production expectations as dependent variable to see whether the influence of media coverage on business expectations of firms translate into a modification of their behaviour. Furthermore, since the variable production expectations can be interpreted as production plans, the answers “better” or “worse” compared to the current production—which supposedly also fol-

lowed a plan—can be more easily interpreted as an expectation update (or planning update) over time than the business expectation variable. The effects with respect to news volume are robust, but the bias towards negative news is less pronounced. Thus, firms adjust their production plans when the intensity of media coverage changes, but in comparison to their general business expectations they are less susceptible to the media tenor.¹⁵

3 Conclusion

Since it takes time and money to acquire and interpret macroeconomic information that is relevant for a firm’s business prospects, many enterprises make use of the news media to lower these information costs. Hence, the media can impact the expectation formation process of firms. We investigate empirically whether this influence goes beyond the actual economic developments the media report about. Thereby, we analyse two potential channels, the intensity of media coverage and its tone. For our microeconomic study, we make use of two exceptional datasets. Firstly, we employ a large panel of business surveys for the German manufacturing sector conducted by the Ifo Institute, which explicitly measures business expectations. Secondly, we use a dataset obtained from the media research institute Mediatenor, which contains detailed information about economic news reports concerning current and future cyclical developments.

Indeed, we find evidence that the news media play a role in the expectation formation process of firms. The higher the volume of macroeconomic news reports, the more likely is a firm to update its own business expectations. This effect is the stronger the larger the changes in the macroeconomic situation. Thus, the mass media reinforce the impact of actual economic developments on business expectations. However, this is only true for negative news; a favourable macroeconomic environment on the contrary dampens the impact of business cycle news.

¹⁵The results of all robustness checks can be obtained upon request.

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Appendix

Table 5: Effects of positive news

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Expectations up</i>						
NEWSPOS	0.21*** (0.01)	0.13*** (0.01)	0.16*** (0.01)	0.27*** (0.02)	0.07*** (0.01)	0.16*** (0.02)
IPMOM		0.71*** (0.03)			0.56*** (0.03)	
IPMOM(-1)		0.51*** (0.03)			0.34*** (0.03)	
IPY0Y		0.10*** (0.03)			-0.06** (0.03)	
DAX		-0.04*** (0.01)			-0.02** (0.01)	
VDAX		-0.17*** (0.01)			-0.10*** (0.01)	
CONSENSUS		-0.29*** (0.09)			0.36*** (0.11)	
ECONPOS (d)			3.69*** (0.12)	4.84*** (0.18)		3.14*** (0.25)
INTECONPOS				-0.13*** (0.02)		-0.09*** (0.02)
CONSTANT	16.06*** (0.08)	21.64*** (0.24)	14.49*** (0.09)	13.62*** (0.15)	19.97*** (0.32)	15.60*** (0.0020)
FIRM CONTROLS	No	No	No	No	Yes	Yes
FIXED EFFECTS	No	No	No	No	Yes	Yes
Observations	434067	434067	434067	434067	434067	434067
Adj. R2	0.004	0.008	0.005	0.006	0.047	0.046

Notes: Results in percentage points, * p<0.10, ** p<0.05, *** p<0.01, robust standard errors in parentheses, d - dummy variable.

Table 6: Effects of negative news

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dependent variable: Expectations down</i>						
NEWSNEG	0.26*** (0.00)	0.14*** (0.00)	0.20*** (0.00)	0.07*** (0.00)	0.11*** (0.00)	0.04*** (0.01)
IPMOM		-1.02*** (0.04)			-0.85*** (0.04)	
IPMOM(-1)		-0.87*** (0.04)			-0.65*** (0.03)	
IPYOY		-0.17*** (0.02)			0.12*** (0.03)	
DAX		0.11*** (0.01)			0.08*** (0.01)	
VDAX		0.36*** (0.01)			0.24*** (0.01)	
CONSENSUS		-0.22*** (0.08)			-0.63*** (0.10)	
ECONNEG (d)			8.66*** (0.12)	3.60*** (0.21)		0.34 (0.26)
INTECONNEG				0.19*** (0.01)		0.16*** (0.01)
CONSTANT	11.48*** (0.10)	5.83*** (0.26)	9.77*** (0.08)	12.32*** (0.10)	8.51*** (0.31)	13.69*** (0.13)
FIRM CONTROLS	No	No	No	No	Yes	Yes
FIXED EFFECTS	No	No	No	No	Yes	Yes
Observations	434067	434067	434067	434067	434067	434067
Adj. R2	0.023	0.038	0.033	0.036	0.130	0.129

Notes: Results in percentage points, * p<0.10, ** p<0.05, *** p<0.01, robust standard errors in parentheses, d - dummy variable.