Halle Institute for Economic Research
Member of the Leibniz Association

Discussion Papers

No. 7
March 2016

Asymmetric Investment Responses to Firm-specific Uncertainty

Manuel Buchholz, Lena Tonzer, Julian Berner

Authors

Lena Tonzer
Halle Institute for Economic Research (IWH) –
Member of the Leibniz Association
Department of Financial Markets
E-mail: lena.tonzer@iwh-halle.de
Tel: +49 345 7753 835

Manuel Buchholz
Halle Institute for Economic Research (IWH) –
Member of the Leibniz Association
Department of Financial Markets
E-mail: manuel.buchholz@iwh-halle.de
Tel: +49 345 7753 755

Julian Berner
Martin-Luther-University Halle-Wittenberg
E-Mail: jlnberner@gmail.com

The responsibility for discussion papers lies solely with the individual authors. The views expressed herein do not necessarily represent those of the IWH. The papers represent preliminary work and are circulated to encourage discussion with the authors. Citation of the discussion papers should account for their provisional character; a revised version may be available directly from the authors.

Comments and suggestions on the methods and results presented are welcome.

IWH Discussion Papers are indexed in RePEc-EconPapers and in ECONIS.

Editor

Halle Institute for Economic Research (IWH) –
Member of the Leibniz Association

Address: Kleine Maerkerstrasse 8
D-06108 Halle (Saale), Germany
Postal Address: P.O. Box 11 03 61
D-06017 Halle (Saale), Germany

Tel +49 345 7753 60
Fax +49 345 7753 820

www.iwh-halle.de

ISSN 2194-2188

Asymmetric Investment Responses to Firm-specific Uncertainty*

Abstract

This paper analyzes how firm-specific uncertainty affects firms' propensity to invest. We measure firm-specific uncertainty as firms' absolute forecast errors derived from survey data of German manufacturing firms over 2007–2011. In line with the literature, our empirical findings reveal a negative impact of firm-specific uncertainty on investment. However, further results show that the investment response is asymmetric, depending on the size and direction of the forecast error. The investment propensity declines significantly if the realized situation is worse than expected. However, firms do not adjust their investment if the realized situation is better than expected, which suggests that the uncertainty effect counteracts the positive effect due to unexpectedly favorable business conditions. This can be one explanation behind the phenomenon of slow recovery in the aftermath of financial crises. Additional results show that the forecast error is highly concurrent with an ex-ante measure of firm-specific uncertainty we obtain from the survey data. Furthermore, the effect of firm-specific uncertainty is enforced for firms that face a tighter financing situation.

Keywords: risk climate, microeconomic survey data, forecast errors, firm investment, uncertainty

JEL Classification: D22, D84, E32

* We thank Claudia M. Buch, Valeriya Dinger, Steffen Elstner, Reint E. Gropp, and seminar participants at the University of Osnabrück, the Martin-Luther-University Halle-Wittenberg, and the University of Magdeburg for helpful comments as well as the Halle Institute for Economic Research (IWH) – Member of the Leibniz Association for providing the data. Hannes Böhm and Friederike Güttner have provided very efficient research assistance. All errors and inconsistencies are solely in our own responsibility.

1 Motivation

Since the start of the financial crisis in 2007/08, future economic developments have become more uncertain. Higher uncertainty is found to have negative effects on investment both at the firm and the aggregate level, and on output growth (Bloom 2009, Fernández-Villaverde 2011, Bloom et al. 2012, Bachmann et al. 2013a, Born and Pfeifer 2014, Christiano et al. 2014, Gilchrist et al. 2014, Kellogg 2014). Understanding how uncertainty affects firms' investment behavior and, consequently, macroeconomic outcomes is key to mitigating economic fluctuations and slow recovery (Reinhart and Rogoff 2014). In this paper, we take a micro perspective on that question. We use survey data of German manufacturing firms over the period 2007–2011 from the IWH risk climate survey to derive a measure of firm-specific uncertainty and analyze its impact on firms' propensity to invest. Following Bachmann et al. (2013a), the measure of firm-specific uncertainty is constructed as the absolute forecast error firms have made when evaluating their business conditions. Because periods of high uncertainty are characterized by future outcomes becoming less predictable (Jurado et al. 2015), these forecast errors can be seen as the firm-level counterpart to (aggregate) uncertainty. Looking at the investment response to uncertainty at the firm level allows one to analyze asymmetric effects regarding the size and direction of the forecast error, and it furthers understanding of the dynamics of firms' investment responses during and in the aftermath of a recession.

In our analysis, we proceed in three steps. First, we derive firm-specific forecast errors firms make when evaluating their business condition, and we take them as a measure of firm-specific uncertainty. We find that firms adjust their expectations with a lag to economic developments. More firms make negative forecast errors at the beginning of the crisis period, that is, firms expected the situation to be better than actually realized. In the further course of the crisis, a higher fraction of firms make positive forecast errors. This suggests that firms became too pessimistic and that the realized situation was better than expected. This finding supports theoretical results by Gennaioli et al. (2015), who show that firms overreact to a series of bad news and adjust beliefs downward. On average, the share of firms making a larger forecast error, whether positive or negative, is higher during crisis times. This pattern is thus analogous to what can be observed for the aggregate uncertainty measures, and it demonstrates a countercyclical pattern of firm-specific uncertainty captured by their forecast error.

Second, in line with the existing literature, we construct the dispersion of firms' forecast errors across all firms in our sample and for each time period to measure aggregate uncertainty. A higher level of cross-sectional dispersion reflects increased aggregate uncertainty (Bachmann et al. 2013a, Bloom et al. 2013, Christiano et al. 2014). We find that our cross-sectional uncertainty measure is increasing during crisis times, evolves similarly to standard measures of aggregate uncertainty such as stock market volatility, and is countercyclical to aggregate investment. A countercyclical pattern of uncertainty is a recurrent finding in the related literature, for instance, by Bloom et al. (2012) and Bachmann et al. (2013a).[1] This gives first evidence that our measure of the forecast error of firm-specific uncertainty derived from survey data contains relevant information on uncertainty at the firm level. Therefore, in further analysis, we explicitly make use of the granularity of our data, which allows us to assess the role of firm-specific uncertainty in real outcomes.

Third, we analyze how firm-specific uncertainty affects the investment responses of firms. Larger forecast errors reflect a higher level of firm-specific uncertainty such that firms can become more reluctant to invest and instead decide to "wait and see". Indeed, our results show that firms are less likely to increase investment following the realization of a larger absolute forecast error while controlling for the current assessment and expectations of firms regarding key business variables such as the financing situation and the costs of raw materials. However, the investment response is *asymmetric*, depending on the size and direction of the forecast error. If the forecast error is negative, that is, the actual situation is worse than expected, the investment propensity declines significantly. If forecast errors are positive and increasing, that is, the realized situation is better than expected, firms do not adjust their investment. Thus, increased uncertainty seems to compensate the realization of unexpectedly favorable business conditions such that firms do not invest more. Given that the fraction of firms making positive forecast errors is higher after the peak of the crisis, we provide micro evidence for uncertainty being a potential reason behind sluggish recovery at the macro level in the aftermath of financial crises (Reinhart and Rogoff 2014). A high level of pessimism triggered by a recession might lead to underestimation of future prospects. In principle, such an underestimation constitutes a positive surprise from the perspective of the individual firm and might spur investment in the aggregate. At the same time, however, uncertainty increases, which might reduce incentives to invest and slowdown economic recovery.

Cross-sectional measures of uncertainty based on firm-level data as well as firm-specific uncertainty measures derived from financial market or balance sheet data are frequently used in the literature in contrast to firm-specific uncertainty measures based on survey data. Thus, we conduct various tests to validate our results. First, we take advantage of the fact that our dataset contains a question about how firms judge the stability of their expectations. This can be interpreted as an *ex-ante* measure of firm-specific uncertainty. Firms that consider their expectations to be stable assume to make a smaller forecast error. This ex-ante measure is highly correlated with the ex-post forecast error at the firm level. Analogously to our results for firms' forecast error, a higher level of uncertainty, that is, a lower perceived stability of

[1] De Veirman and Levin (2016) construct an aggregate measure of uncertainty based on firm-specific volatility in sales or earnings growth of US firms and find weaker evidence for counter-cyclicality than dispersion-based measures.

expectations, reduces firms' investment propensity. Second, we focus on an often-emphasized channel through which uncertainty is transmitted, namely, financing constraints (Arellano et al. 2012, Gilchrist et al. 2014). We find that forecast errors matter for investment responses, particularly for financially constrained firms. The quantitative effect of forecast errors on the investment response loses statistical significance if firms have a good financial situation. This result is in line with the related literature and reveals that survey-based measures of firm-specific uncertainty are complementary to financial market or balance sheet data-based measures. Finally, our results remain robust after conducting a further set of specification tests by changing the estimation method, time period, or list of control variables.

The data we rely on is a unique dataset based on firm-level survey data of German firms. The "IWH risk climate survey" was obtained from the Halle Institute for Economic Research (IWH). It offers various advantages that allow one to identify the effect of firm-specific uncertainty on investment behavior. First, at a half-yearly frequency, it spans the period from the first quarter of 2007 to the third quarter of 2011, such that we can compare the evolution of firms' forecast errors and investment responses starting from a non-crisis period, covering the financial crisis, and entering a recovery phase. While the German economy recovered relatively fast after the crisis, investment has remained below pre-crisis levels (Banerjee et al. 2015). This weakness in investment is similar to other European countries and the US (Barkbu et al. 2015, OECD 2015). Additionally, the crisis came unexpectedly, which provides an exogenous event that drives firms' forecast errors independently of firm-specific characteristics. Second, we have a large number of small and medium-sized manufacturing firms located in different parts of Germany, which gives a sufficient degree of heterogeneity.

Third, the survey questions are sufficiently rich to study our questions of interest and to construct the forecast errors.[2] The survey includes questions on firms' expectations and evaluation of the current situation regarding key firm variables, firms' investment responses, and firm-specific information such as size or revenue. By including these expectation variables, we can disentangle the effect of firm-specific uncertainty on investment from any effect on real outcomes stemming from the realization of a large unexpected (negative) shock in itself, as documented by Orlik and Veldkamp (2014). Furthermore, we have information on firms' risk attitude, which allows us to separate effects due to forecast errors from those due to risk aversion. Finally, there is information on how firms judge the stability of their expectations, which provides an ex-ante, perceived measure of uncertainty that we can compare to the ex-post, realized forecast error.

The paper relates to three main strands of literature. First, there are studies that analyze how expectations are formed. The focus is most often on whether firms form expectations in a

[2] Our approach to constructing firms' forecast errors and deriving a measure for uncertainty is similar to that of Bachmann et al. (2013a), who use firm-level survey data to construct aggregate measures of uncertainty.

rational way by exploiting all available information efficiently or whether expectations are formed in an adaptive way. The results obtained in this literature are ambiguous, and the rational expectation hypothesis can often not be confirmed. Early work of Zimmermann (1986), for example, uses survey data of German firms on expected and actual business conditions and rejects the hypothesis of rational expectations.[3] In a recent paper, Gennaioli et al. (2015) analyze why firms underestimate the possibility of a crisis in good times and overreact to bad news in crisis times. They argue that, in contrast to rational expectations, beliefs are formed according to previously observed data, giving less weight to other outcomes. In this paper, we are mainly interested in how firms' forecast errors affect investment responses. The motivation is that as soon as firms form an expectation about the future and as soon as the resulting forecast errors affect investment responses, there are real economic effects. This holds irrespective of how the underlying expectations are formed, whereas the size and direction of firms' forecast errors might affect investment behavior.

The second strand of literature analyzes investment behavior of firms under uncertainty. Uncertainty is often found to have a weakening effect on investment (Bernanke 1983, Leahy and Whited 1996, Bloom et al. 2007, Kellogg 2014). The reason is that if uncertainty is high, firms tend to "wait and see" instead of investing, particularly if investment decisions are irreversible (Bloom 2009, Bloom et al. 2012). This can cause a slowdown in aggregate economic growth. Using micro-level data for UK manufacturing firms, Bloom et al. (2007) show that firms become more cautious in investing if uncertainty measured by firm-specific stock return volatility increases. Based on Italian survey data, Guiso and Parigi (1999) come to similar conclusions. They find that manufacturing firms increase investment less in response to demand if uncertainty is higher. This effect is confirmed at the macro level (Fernández-Villaverde 2011, Bachmann et al. 2013a, Christiano et al. 2014). These authors find that sudden and unexpected increases in time-varying volatility or cross-sectional dispersion measures cause aggregate declines in output. We add to this strand of literature in that we analyze the asymmetric effects of firm-specific uncertainty at the micro level.

The third strand of literature is related to firm-specific determinants of investment behavior, such as the financing situation and risk aversion. Firms' investment responses might depend on both internal financing resources and access to external funds and their costs. Financial frictions can impose constraints on firms that result in reduced investment (Arellano et al. 2012). Gilchrist et al. (2014) show that in times of higher uncertainty firms' credit spreads,

[3] Similar results are found by Svendsen (1993) using Norwegian survey data regarding firms' price and demand expectations. Dave (2011) uses Canadian data on firms' expectations and actual volumes about capital expenditures and rejects both the rational and adaptive expectation formation hypothesis. Coibion et al. (2015) focus on firms' inflation expectations in New Zealand and find evidence for Bayesian updating with firms incorporating new information once available.

and thus, capital costs increase, resulting in a contraction of capital expenditure.[4] Additionally, risk aversion can be a key determinant of firms' investment behavior. The more risk-averse a firm is, the less willing the firm is to invest. The effect of uncertainty on investment is likely to change with firms' risk aversion (Panousi and Papanikolaou 2012). This is particularly important in crisis times, when uncertainty tends to increase and firms become more risk-averse. For example, Guiso et al. (2013), using Italian survey data, show that investors' risk aversion is higher after the financial crisis. Therefore, it is important to disentangle the effects stemming from variation over time in risk aversion compared to changes in uncertainty. Our dataset allows us to do so. We contribute to the literature on the determinants of firm investment by asking whether investment responses are affected by firm-specific uncertainty, measured by a firm's forecast errors, while controlling for financing constraints and risk aversion.

The paper is structured as follows. In section 2, we describe the data with a particular focus on the IWH risk climate survey. Furthermore, we present descriptive statistics related to the research questions. We show how forecast errors and investment responses evolved over time and across firms. Section 3 explains the regression model and shows the results. Section 4 concludes the paper.

2 Data Description and Summary Statistics

This section first describes the IWH risk climate survey, the construction of the underlying survey and its coverage. Second, we explain the computation of firm-level forecast errors and the measurement of aggregate uncertainty, and we show the evolution of these series over time and across firms. Third, we provide descriptive graphical evidence for the relationship between firms' ability to forecast and their propensity to invest.

2.1 IWH risk climate survey

The risk climate survey of the IWH covers the period from 2007Q1 to 2011Q3.[5] While the survey data are confidential, they can be used within the IWH in accordance with the research data center of the IWH. Surveys have been conducted every half a year in spring and autumn, and we have data for ten different waves. The survey was sent to the executive directors of 6,000 manufacturing firms per wave; however, not all of them responded. If firms did not respond to two continuous waves, they were dropped from the sample. Firms could respond by sending a fax or letter or by answering online. For the first three waves, only selected

[4] Access to external funding can also become more difficult if banks provide less loans to non-financial firms during periods of increased uncertainty. Buch et al. (2015) find that banks reduce lending if uncertainty in the banking sector increases.

[5] The survey was stopped in 2011 due to organizational changes within the institute.

sectors of the manufacturing industry are included. The subsequent seven waves include firms of all sectors, e.g., chemical, leather, wood, and engineering. Firms were chosen based on a random sampling procedure.[6]

The survey has two main components: First, it contains "core" questions asking firms about their evaluation of current business conditions and the economic situation, their expectations with respect to future development, their judgment of the stability of the expected development, and the resulting implications for the firm. All of these questions are asked with reference to the general business and economic conditions of the firm and subcategories such as production, revenues, or competition. Firms also give an evaluation of their willingness to take risks, whether they have achieved their targeted amount of revenues, and how they expect their investment behavior to evolve. In general, firms have five answer options to indicate whether they expect, for example, a (strong) deterioration (-/--), no change (0), or a (strong) improvement (+/++) of future business and economic conditions. An example of the survey containing all questions and answer options can be found in the appendix.

Second, questions are asked about the firm's sector, the most important product, the amount of revenue in the last accounting year, and the share of revenue generated abroad. Furthermore, we know whether the firm has participated in the survey, the location of the firm (Eastern or Western Germany), and in which size range the firm falls in terms of employees. "Small" covers firms with 1-4 or 5-24 employees, "medium" refers to firms with 25-74 employees, and "large" covers firms with more than 74 employees. Summary statistics of the number of reporting firms by wave and different subcategories, such as the number of employees and revenue, can be found in Tables 1 and 2.

[Insert Tables 1-2 here]

Given that the survey is conducted for a limited number of firms, including mostly smaller firms, the validity of the responses is crucial for further analysis. To verify whether we can rely on firms' responses, we use our data to reconstruct the balance on which the well-known Ifo business climate index for the Germany economy is based.[7] This allows us to compare the evolution of the original Ifo business climate balance to our reconstructed balance. Figure 1 shows the results. It is obvious that the two series are remarkably similar. This holds despite that the Ifo business climate survey is based on a higher number of participating firms (approximately 7,000), is conducted at a higher frequency (monthly), and contains firms from different sectors (manufacturing, construction, wholesaling and retailing). This gives us

[6] The random sampling procedure is based on the distribution of firms in the firm database Markus of Creditreform and based on the number of firms per sector, firm size, and location in Eastern and Western Germany. Firms are anonymized such that no matching of firm-specific balance sheet data or income statements from other sources is possible.

[7] The construction of the Ifo business climate balance is explained in the appendix and corresponds to the description found here: www.ifo.de/w/45YCTv5Bp.

confidence in the validity of the survey outcome obtained from the IWH risk climate survey. The only discrepancy arises in the level. This can be explained by the fact that, in contrast to the Ifo business climate survey, we have mostly smaller firms in our sample. Smaller firms are more likely to be too optimistic in their expectations (Bachmann and Elstner 2015).

[Insert Figure 1 here]

2.2 Firms' forecast errors

In this paper, we evaluate how firms' forecast errors affect their investment responses. Thus, we need a measure for firms' forecast error. The idiosyncratic forecast error compares the firm's expected situation with the realized situation one period later (Bachmann et al. 2013a). The forecast error is calculated such that it ranges from "FE -2" (situation was worse than expected) to "FE 2" (situation was better than expected).[8] A detailed description of the calculation of the forecast error can be found in the appendix.

This measure is, hence, a firm-specific forecast error, whereas a larger forecast error reflects less predictability and thus higher uncertainty from the perspective of the individual firm. Uncertainty is thus measured from an *ex-post* perspective, as the forecast error compares the realized situation in period *t* with the expected situation in *t-1*. In further analysis, the forecast error will be linked to investment responses in period *t*. Alternatively, we use an *ex-ante* measure of uncertainty based on how firms evaluate the stability of their expectations (see Chapter 3.1). Using survey data to measure firm-specific uncertainty has the advantage that we obtain the level of uncertainty perceived by the decision makers (firms)—instead of, for example, professional forecasters—whose investment behavior in aggregate can potentially affect macroeconomic outcomes.

Table 3 shows the distribution of the forecast error, which has five different categories (FE -2, FE -1, FE 0, FE 1, FE 2) based on the overall situation of the firm for each wave. Because the survey starts in the first quarter of 2007 (2007q1) and because we do not have firms' expectations from the previous quarter, the series of forecast errors starts from the second wave. The percentage share of firms by size of the forecast error is depicted in the columns of the table. Across the whole sample, the share of firms that had a forecast error of zero is highest, with an average of 60%. If we look at the distribution by wave, *asymmetric* patterns arise. At the beginning of the crisis 2008q3/2009q1, the share of firms with a negative forecast error is relatively higher compared to other waves. This suggests that more firms expected the situation to be better than realized and underestimated the crisis effect (>20% for

[8] Alternatively, we compute a forecast error that has nine categories and ranges from "FE -4" to "FE 4", or three categories ranging from "FE -1" to "FE 1". For our baseline model, we prefer to use the forecast error with five categories, as it presents a sufficient degree of variation without having to make too many assumptions on the scaling and without having to deal with the problem of few observations in the tails.

FE -1, >5% for FE -2). In contrast, in the following quarters 2009q3/2010q1, more firms had worse expectations about the future than what was realized (>20% for FE 1, >3% for FE 2).

[Insert Table 3 here]

This demonstrates that during tranquil times, a large number of firms predict the future well. The pattern reverses during crisis times: at the beginning of a crisis, firms are too optimistic, while as the crisis continues, they become too pessimistic. A possible explanation is that firms did not see the crisis coming and then expected the crisis to be worse and more persistent. This finding would support the result of the theoretical model by Gennaioli et al. (2015), showing that only a sequence of bad news causes a change in investors' beliefs. However, the adjustment in beliefs is too extreme, and investors become too pessimistic.

We use the *firm-level* data and derive three cross-sectional measures at the *aggregate level* to capture the degree of uncertainty in the overall economy.[9] Higher uncertainty is thereby reflected by, on average, larger and/or more disperse forecast errors/expectations across firms. The first two measures are based on the firm-specific forecast error. For the first measure, we take the mean of the absolute value of the idiosyncratic forecast errors (*Mean abs. FE*). The higher the mean, the larger the average forecast error, irrespective of whether the forecast error is positive or negative. For the second measure, we calculate the standard deviation of the idiosyncratic forecast errors (*SD FE*). The third measure is derived from firms' expected changes instead of forecast errors and captures the discrepancy in firms' expectations in each period (*FDISP*). The measure can be interpreted such that a higher dispersion in firms' expectations reflects a higher level of uncertainty in the economy (Bachmann et al. 2013a).

The evolution of these three measures across time is shown in Figure 2.[10] The measures derived from the idiosyncratic forecast error, that is, the mean absolute forecast error and the standard deviation of the forecast error, evolve similarly. They start at low levels at the beginning of the sample period, increase with the onset of the financial crisis and reach their peak in the first quarter of 2009 before declining again. In contrast, the third measure, calculated as the cross-sectional dispersion of firms' expectations, reaches its peak already in the third quarter of 2008.[11] The series stays at elevated levels before declining during the year 2010, but it shows an increase again at the end of the sample, which might be related to events during the European sovereign debt crisis. For comparability with other commonly used uncertainty measures, we also depict the stock market volatility (Bloom 2014). It can be seen that the time pattern of the uncertainty measures derived from our survey data closely tracks

[9] The derivation of these measures is explained in detail in the appendix.
[10] The pattern of the aggregate uncertainty measure is similar if we construct a forecast error with three (nine) categories: there is only a downward (upward) shift in the level.
[11] Because the third measure is based on the dispersion of expectations and does not take into account the errors firms have made in their forecasts, we would argue that uncertainty still increases from the third quarter of 2008 to the first quarter of 2009.

the development of stock market volatility. This provides further evidence that the survey responses as well as the way the forecast error is computed delivers reliable information.

[Insert Figure 2 here]

Discrepancies in firms' ability to forecast might vary across time and across firm characteristics, such as size or revenue. For example, larger firms might have access to more information. The same might apply to firms with more financial resources. Their (perceived) ability to generate accurate forecasts, in turn, might translate into lower uncertainty. To obtain a first impression of this issue, we plot the mean absolute forecast error across all firms that fall in one size or revenue category. Figure 3 shows the evolution of the mean absolute forecast error by firm size. Consistent with the aggregated view in Figure 2, the series are increasing at the beginning of the sample period, corresponding to the start of the financial crisis, and reach lower levels again in 2011, though the decline is less pronounced for smaller firms. A similar pattern can be observed if the mean absolute forecast error is shown by firm revenue (Figure 4). This suggests that uncertainty increased for all types of firms during the financial crisis. For large firms, however, we find some evidence that they reach lower levels of uncertainty at the end of the sample period. This might be related to the fact that large firms can respond more flexibly to new business conditions and changes in the economic situation because they are more diversified or internationally integrated than smaller, more specialized, and local firms.[12]

[Insert Figures 3-4 here]

In sum, the time series pattern of our aggregate uncertainty measures shows that discrepancies in firms' accuracy of expectations and, thus, forecast errors increase during the financial crisis, which was a period of high uncertainty regarding the stability of the financial system and future economic growth. While firms' forecast errors react with a lag to worsening economic conditions, the fraction of firms that underestimate future economic conditions increases during crisis times. This suggests that the evolution of discrepancies among firms' perceptions is linked to the state of the macro economy, with periods of financial and real distress being accompanied by less-uniform and more-pessimistic perceptions at the firm level.

2.3 Investment responses

The level of uncertainty and firms' ability to forecast can affect firms' investment behavior. For example, Bloom et al. (2012) show that under uncertainty about future economic developments, firms might want to "wait and see" and postpone investment decisions. This

[12] If we plot the distribution of the forecast error by firm or revenue, we do not find systematic differences; rather, we find similar distributions irrespective of firm size or revenue.

holds in particular if investments are irreversible and the option value of waiting is high (real options effect) (Bernanke 1983). To obtain a first visual impression of the relation between uncertainty and investment, we plot the mean absolute forecast error and the cross-sectional dispersion of the forecast error against the percentage change in equipment investments in Germany using data from the German federal statistical office (Figure 5). Similar to related work, our aggregate measures for uncertainty derived from survey data are countercyclical to the business cycle (Bachmann et al. 2013a, Bloom 2014).[13]

[Insert Figure 5 here]

To shed more light on the drivers of firms' investment behavior, we exploit the richness of our survey data and study the role of a firm's (i) forecast error, (ii) expectations about future economic conditions, (iii) risk attitude, and (iv) financial constraints. First, Figure 6 relates the investment propensity to the size of the firm's idiosyncratic forecast error, that is, to our measure of firm-specific uncertainty. A reduction in investments is coded with a minus (-/--), zero stands for no change (0), and a plus sign indicates an increase in investments (+/++). The forecast error measures the difference between the expected and realized economic situation. Therefore, negative values signal that the actual situation was worse than expected (FE -2 and FE -1), and positive values signal that the actual situation was better than expected (FE 1 and FE 2).

The fraction of firms that intend to reduce investment is higher if the **forecast error** is negative, meaning that firms were too optimistic regarding future development (upper left panel). However, the contrary does not hold true: firms with a positive forecast error do not decide to increase investment relatively more (lower right panel). This suggests that the negative experience of being too optimistic ex-ante makes firms more uncertain and more reluctant to increase planned investment ex-post. Meanwhile, firms that experience a better outcome than expected are unlikely to project this "positive surprise" into the future by increasing their investment. This is a first indication that the uncertainty effect associated with realized forecast errors prevails. The sheer fact that a firm made an error in its forecast—even when the actual realization turns out to be better than expected—dampens or at least does not increase investment. In sum, the uncertainty effect on investment seems to be *asymmetric*, i.e., more pronounced given a worse-than-expected as opposed to a better-than-expected situation.

[Insert Figure 6 here]

Second, **expectations** about the future situation of the company can affect firms' investment behavior. For example, if the future economic outlook is bad, firms might be inclined to delay

[13] To verify that this result also holds for the individual manufacturing sector, we compute the mean absolute forecast error (as well as the standard deviation of the forecast error) by manufacturing sector and match these series to the aggregate investment volume in the respective sector. This reveals that a higher value of sectoral uncertainty is related to lower investment volumes within the sector. These graphs are available upon request.

costly and irreversible investment. Figure 7 depicts the distribution of firms' planned changes in investment by expected change in a firms' economic situation. A reduction in investments corresponds to a minus sign (-/--), zero stands for no change (0), and a plus sign indicates an increase in investments (+/++). The expected change in a firm's overall economic situation is ordered in five categories: minus stands for an expected deterioration (-/--), zero for no change (0), and a plus sign indicates an expected improvement in the overall situation (+/++). Similarly to before, the fraction of firms that are likely to invest less in the future is higher if the firm expects a worsening of its economic situation (upper left panel). However, if an improvement in the overall economic situation is expected, the picture reverses, and the fraction of firms that would like to increase their investment is higher (lower right panel). This *symmetric* pattern reveals that expectations alone do *not* incorporate the uncertainty reflected by the forecast error.

[Insert Figure 7 here]

Third, investment behavior might vary with firms' **risk attitude** because returns are not certain but depend on the success of the investment project. Thus, Figure 8 shows the distribution of firms' planned changes in investment for different sizes of the forecast error based on a firm's risk attitude. A reduction in investments corresponds to minus (-/--), zero stands for no change (0), and a plus sign indicates an increase in investments (+/++). Based on the survey question, the risk attitude is defined in terms of the willingness to take risks and is thus an inverse measure for risk aversion. The expected change in risk attitude is defined between minus (low risk attitude) and plus (high risk attitude), while zero stands for a moderate risk attitude. Figure 8 demonstrates that the relationship between the willingness to take risks and planned investment changes. The fraction of firms that are more likely to decrease investment is relatively high when firms are risk-averse (upper left panel). However, if firms are less risk-averse, the fraction of firms that increase investments is higher (lower right panel).[14]

[Insert Figure 8 here]

Fourth, the investment behavior might be conditional on the firm's **financing situation**. Firms that report a (very) bad financial situation are more likely to be financially constrained, which potentially translates into reduced investment. The link between firms' financial situation and expected investment behavior is illustrated in Figure 9. A reduction in investments corresponds to minus (-/--), zero stands for no change (0), and a plus sign indicates an increase in investments (+/++). The financial situation can be assessed in five categories: lower values stand for (very) bad financial conditions (-/--), a reasonable financial situation is reflected by zero, and a (very) good conditions is depicted by plus (+/++). Again, we observe

[14] The same pattern emerges if we exchange firms' current assessment of the risk attitude with their expected change in risk attitude.

a symmetric pattern. A larger fraction of firms tend to reduce investment if financial conditions are tight (upper left panel). In contrast, the distribution becomes left-skewed if firms do not face financial constraints (lower right panel).

[Insert Figure 9 here]

In sum, this section has shown that firms tend to invest more (less) if they have positive (negative) expectations about the future, a good (bad) financial situation and a higher (lower) risk attitude. In contrast, the investment response to the forecast error is asymmetric: firms tend to invest less if they incur a larger negative forecast error, but there is no relevant shift toward more investment for firms with a larger positive forecast error. While these conclusions are drawn from descriptive statistics, the next section will verify whether these patterns can be validated using a regression framework.

3 Regression Design and Results

In this section, we present the econometric model to analyze whether firms' forecast errors affect their investment propensity. We start with a baseline model in which the expected change in the investment volume is the dependent variable and our explanatory variable of interest is the firm's absolute forecast error. We then disaggregate the forecast error into positive and negative components to verify the existence of asymmetric effects. Finally, we conduct robustness tests using firms' perceived stability of expectations as an ex-ante measure of uncertainty, and we evaluate the role of financing constraints as a transmission channel of firm-specific uncertainty.

3.1 The effect of firms' forecast errors on investment

To analyze the effect of firm-specific uncertainty on investment, we use an ordered probit regression framework and set up the following empirical model: [15]

$$Investment_{i,t} = \alpha + \delta' \quad CUR_{i,t} + \lambda' \quad EXP_{i,t} + \sigma \quad FirmRev_{i,t} + \gamma \quad RiskAttitude_{i,t} \\ + \beta \quad Abs.FE_{i,t} + \tau_t + \omega_j + \epsilon_{i,t} \tag{1}$$

where $Investment_{i,t}$ is our dependent variable, denoting the expected change in the investment volume of firm i in period t measured on an ordinal scale. This scale has five outcome categories and ranges from a (strong) decrease to no change to a (strong) increase.

Our main explanatory variable is the firm's forecast error, $Abs.FE_{i,t}$, and we take the absolute value of the five category forecast error.[16] Hence, higher values indicate a larger forecast

[15] More formally, $Investment_{i,t}$ reflects the continuous latent variable in the ordered probit model, which is linked via the normal distribution function to the five-scale outcome variable on investment, as observed in the data, depending on the internally estimated cutoff points.

error, that is, the actual situation differs more from the expected one. We expect that firms that make a larger absolute forecast error are less likely to invest. This might occur because they become more careful after having realized their misjudgment.

To ensure that the estimated coefficient of the forecast error reflects the impact of firm-specific uncertainty on investment and is not distorted by the effect of other factors, we include a set of control variables. Most importantly, we control for the firm's $Risk\ Attitude_{i,t}$. In the baseline specification, we use firms' current risk attitude. The variable has five outcome categories, where higher values indicate that firms are more willing to take risks. In robustness tests, we also control for the expected change in risk attitude. We expect that the higher the risk attitude of firms, the more likely they will increase their investment. If firms are risk-averse and future returns are uncertain, they might prefer to delay current investments (Panousi and Papanikolaou 2012).

Additionally, we include firm-level controls that capture firms' current ($CUR_{i,t}$) and expected ($EXP_{i,t}$) assessments of key business conditions and economic variables, namely, competition, financing possibilities, cost of raw materials and inputs, and the overall economic situation in Germany. The variable $FirmRev_{i,t}$ indicates the approximate revenue and is grouped in five different categories (see Table 2).[17] Firm revenue is highly correlated with the number of employees such that this variable should capture both firms' financial revenues and size. It thus controls for firm-specific characteristics that are potentially related to firms' ability to forecast.

The inclusion of these variables capturing the current assessment and expectations allows us to disentangle firm-specific uncertainty from the effect of negative "tail events", i.e., unexpectedly large changes in key economic variables. In particular, during and after crises, the experience of such a large shock or tail event might impact the expectations of firms, their investment behavior and their macroeconomic outcomes (Rancière et al. 2008, Orlik and Veldkamp 2014). If the occurrence of such a shock has an impact on the investment response, it should be through an adjustment in the assessment and expectations about the key economic variables. In this sense, if there is a remaining effect of the forecast error on the investment propensity when controlling for these expectations, we can attribute it to firm-specific uncertainty.

The baseline model is augmented by sector fixed effects ω_j, time fixed effects τ_t, or both. This allows us to control for sector-specific characteristics that are common to all firms in that

[16] Bachmann et al. (2013b) proceed similarly and take the absolute value of firms' forecast error.
[17] From the survey, we also obtain information on the number of employees and revenue abroad. However, because these variables are highly correlated with revenue, we do not include them simultaneously. See also the robustness section.

sector as well as aggregate dynamics that affect all firms alike. Standard errors are clustered by firm.

Baseline specification

Table 4a shows results for the baseline specification, including the forecast error in absolute terms, which ranges from zero (the situation at time *t* is equal to the expected situation at time *t-1*) to two (the situation at time *t* is better/worse than the expected situation at time *t-1*). It can be seen that a higher value of the absolute forecast error decreases the propensity to invest. This means that firms tend to decrease investment in the presence of higher firm-specific uncertainty. The effect of firm-specific uncertainty remains negative and significant if we control for time and/or sector-specific fixed effects (Columns 2-4). To obtain information on the quantitative impact, Table 4b shows marginal effects of the forecast error according to the outcome category of the investment response.[18] The results show that a one-unit-larger absolute forecast error reduces the probability to invest more by 1.8 percentage points, on average (Column 4).

[Insert Tables 4a-b here]

We also obtain significant results for the other control variables. A currently (or expected) more favorable competitive situation, a good financing situation, and a good situation of the German economy tend to increase investment. A negative sign is obtained for improvements in costs of material or higher firm revenue. The former finding suggests that firms use their funds to buy material (instead of investing) when material costs are low. The latter finding suggests that it is rather the smaller firms with lower levels of revenue that are more likely to expand and thus invest. As expected, risk attitude shows a positive and significant coefficient. Thus, less risk-averse firms show a higher investment propensity. Again, the results do not vary much depending on the choice of fixed effects. Thus, when controlling for a firm's current and expected situation, its revenue, and sectoral as well as time fixed effects, we find a significantly negative effect of the firm-specific forecast error on investment responses. Following the graphical results in Section 2.3 about the asymmetric investment response to positive/negative forecast errors, we extend the analysis and disaggregate the forecast error accordingly.

Disaggregated forecast error and asymmetric investment response

To evaluate what drives the significant coefficient of the forecast error in Table 4a, we decompose the forecast error. To do so, we control for cases in which the forecast error has been larger or equal to zero and cases in which the forecast error has been smaller than zero

[18] Marginal effects remain stable for the regressions, including fixed effects. For brevity, we do not include them, but they can be obtained upon request.

by interacting the absolute forecast error with a corresponding indicator variable. In doing so, we can disentangle the heterogeneous effects of firm-specific uncertainty on investment depending on whether firms have over- or underestimated their general situation. Table 5a shows that the coefficient of the forecast error is significantly negative when the actual situation is worse than expected (FE<0). Table 5b (upper panel) shows the marginal effects for the negative forecast error by outcome category of the investment variable. A negative forecast error increases the probability to decrease investment by 3.2 percentage points (Column 1). In contrast, no significant result is obtained for a positive forecast error (FE≥0), and the marginal effects are also not significant. Hence, we can confirm that firms respond *asymmetrically to higher uncertainty.*

[Insert Tables 5a-b here]

This suggests that the significant result found in the baseline specification is mostly driven by negative realizations of the forecast error. Ex-post uncertainty, that is, the revealed misjudgment and overestimation of future conditions, reduces the probability that firms invest more. Surprisingly, if the actual situation is better than expected, this does not cause firms to become more optimistic and to invest more. The reason might be that firms become more careful due to their incorrect forecast and perceive a decrease in their ability to forecast. Hence, the "wait and see" effect of this increase in uncertainty compensates the positive signal of a better-than-expected outcome. Analyzing the drivers behind this asymmetry result in more detail is an interesting avenue for future research, but it requires more information at the level of the individual firm.

The descriptive statistics have shown that positive forecast errors occur predominantly during crisis times (Figure 2, Table 3). If firms become too pessimistic during crisis times, which in turn reduces their investment propensity through the uncertainty channel, this might explain the sluggish recovery in the aftermath of financial crises (Reinhart and Rogoff 2014). This is in line with the finding of quantitative models that the impact of policy measures is dampened if uncertainty is higher due to firms becoming more cautious (Bloom et al. 2012). Veldkamp (2000) explains the asymmetry between rapid downturns and slow recovery in financial markets by the amount of information in the market. In stable times, market participants are actively investing and a rich set of information is generated, which causes sudden downturns once negative information is transmitted. In the course of the financial crash, investment decreases and lending rates rapidly increase. In contrast, recovery is slow because the level of information is low, and uncertainty is high, such that lending rates remain at elevated levels and investment remains reduced.[19]

[19] Asymmetric effects of increased volatility on stock returns have been found in the asset pricing literature, one reason being the time-varying risk premia (see e.g. Bekaert and Wu 2000, Campbell and Hentschel 1992).

In this context and regarding external validity, it is important to note that Germany adopted a number of (fiscal) policy measures to stimulate the economy during the crisis. Additionally, the German economy recovered relatively quickly after the global financial crisis compared to other European countries or the USA. Nevertheless, we find significant effects of firm-specific uncertainty on firms' willingness to invest. This might be because our sample covers mostly smaller firms that had less flexibility in adjusting during the crisis and became more careful in the aftermath of the crisis than the larger export-oriented firms. Nevertheless, Germany might still reflect a lower bound, and in countries more affected by the recent financial crisis, we would expect stronger effects of firm-specific uncertainty that explain staggered investment in the aftermath of the economic downturn.

Stability of expectations

Finally, we use the survey responses to the question on the stability of expectations, which provides us an *ex-ante* measure of (perceived) uncertainty from the perspective of the firm. The variable has five possible outcomes and ranges from minus (-/--) if the stability of expected developments is judged as (very) instable to plus (+/++) if it is evaluated as (very) stable. Table 6a shows that a higher stability of expectations increases the probability to invest more. Hence, if firms believe their expectations are stable, this ex-ante certainty translates into increased investment. Table 6b presents marginal effects that are significant across all outcome categories of the investment variable. A higher stability of expectations about future developments thus increases the probability to increase investment by 4 percentage points.

[Insert Tables 6a-b here]

Thus, the results obtained from an *ex-ante* measure of firm-specific uncertainty point in the same direction and are consistent with those obtained from our *ex-post* measure, that is, the forecast error. To further validate the concordance of both the ex-ante and ex-post measures of uncertainty, we use the stability of expectations as the dependent variable in our regression framework. The results in Table 7 show that the absolute forecast error has a negative and highly significant coefficient. We take this as evidence that, first, there is a significant relationship between the ex-ante and ex-post measures of uncertainty and that, second, firms that have a larger absolute forecast error are less likely to report stable expectations. This makes intuitive sense because if firms recognize that they have a larger absolute forecast error, they face a higher level of realized uncertainty that is likely to erode the perceived stability in their expectations today.

[Insert Table 7 here]

Rancière et al. (2008) use the skewness of credit growth instead of the variance to capture asymmetric effects of systemic risk on per capita GDP growth.

In sum, we find that higher absolute forecast errors, that is, an ex-post measure of firm-specific uncertainty, make investment less likely. This result remains valid when using an ex-ante measure of uncertainty: firms that are less certain, that is, they consider their expectations to be less stable, tend to invest less. However, when looking at the absolute forecast error, it is insufficient to trace heterogeneous effects of firm-specific uncertainty. Once we disaggregate positive and negative forecast errors, the investment responses are asymmetric. Overestimations of future conditions worsen the propensity to invest. Underestimations, however, do not improve the propensity to invest. This suggests that better-than-expected developments are counteracted by the effect of higher uncertainty.

3.2 Financing constraints and forecast errors

To further validate the use of the survey-based forecast error as a measure of firm-specific uncertainty, we investigate how it interacts with firms' financing constraints. A large body of literature shows that firms reduce their investment if they are constraint in their financing situation due to financial frictions (Arellano et al. 2012, Gilchrist et al. 2014). This effect can be enhanced in an uncertain environment. In contrast to our approach, this result is most often derived using, for example, firm-specific uncertainty measures based on financial market data in contrast to survey-based measures. Transferring these results to our framework, we expect that firms that poorly evaluate the financing situation for investments and that make larger absolute forecast errors are more likely to reduce their future investment volume.

To test whether we can draw similar conclusions using our measure of firm-specific uncertainty derived from survey data, we extend the baseline equation (1) by including an interaction term between the forecast error and firms' financing situation. The model then takes the following form:

$$\begin{aligned} Investment_{i,t} = \alpha + \delta' \quad CUR_{i,t} + \lambda' \quad EXP_{i,t} + \sigma \quad FirmRev_{i,t} + \gamma \quad RiskAttitude_{i,t} \\ + \beta \quad Abs.FE_{i,t} + \tilde{\beta} \quad Abs.FE_{i,t} \quad Financing_{i,t} + \tau_t + \omega_j + \epsilon_{i,t} \end{aligned} \tag{2}$$

where, as before, $Investment_{i,t}$ is our dependent variable and denotes the expected change in the investment volume of firm i in period t measured on an ordinal scale with five possible outcomes. In addition to the previous model, we include the interaction term between the absolute forecast error and the firm's current financing situation: $Abs.FE_{i,t} \quad Financing_{i,t}$. The variable $Financing_{i,t}$ ranges from bad (-) to middle (0) to good (+).[20]

To evaluate the impact of the interaction term, we compute marginal effects of the forecast error across all outcome categories of the investment response variable conditional on the current financing situation. Table 8 shows that, like in the baseline specification, an increase

[20] The financing variable thus has three outcome categories, but we do not discriminate between good and very good or bad and very bad.

in the absolute forecast error decreases the probability to invest. This effect is stronger for firms with a weak financing situation (-). Marginal effects decline and become insignificant under a better financing situation (+).

[Insert Table 8 here]

This result is also reflected in Figure 10, which plots the marginal effects of the absolute forecast error for the first outcome category of the investment response (strong decrease) for different values of the financing situation: a larger absolute forecast error has a positive impact on the probability that firms strongly decrease their investment, whereas the effect is larger for firms with a bad financing situation (-). This suggests that the role of firm-specific uncertainty measured by forecast errors loses relevance when firms are less financially constrained. This finding is in line with the literature and thus indicates that the use of survey data to derive a firm-specific uncertainty measure is a valid complement to financial market- or balance sheet-based measures.

[Insert Figure 10 here]

3.3 Further robustness tests

We conduct a number of additional tests to check the robustness of our results obtained from the baseline specification (1). To do so, we repeat the analysis but change the estimation method (Table 9, columns 1-3). First, we use an ordered logit model; second, we estimate the regressions using a random effects ordered probit model; and third, we cluster the standard errors not by firm but by sector. Furthermore, we limit the sample period and use only observations starting from wave three. From then on, the survey questions and sample composition remain stable (Column 4). In addition, we use the correlated random effects approach to control for the effect of unobserved heterogeneity at the firm level (Column 5).[21] Despite these changes, the coefficient of the absolute forecast error remains negative and significant.

[Insert Table 9 here]

To check the stability of our results regarding firms' revenues, we exchange the revenue variable with the achieved sales target (Table 10, column 1). Firms that have not achieved their sales target might be less willing to invest, as their loss aversion increases and part of this effect might be hidden in the forecast error. Thus, it can be helpful to control for it. The

[21] The correlated random effects model goes back to Mundlak (1978) and provides an alternative to the fixed-effects estimator. It allows controlling for unobserved individual heterogeneity but does not suffer from the incidental parameter problem. See Wooldridge (2010) for nonlinear models (such as ordered probit) for the case of unbalanced panels. Technically, the correlated random effects model controls for unobserved individual heterogeneity by including all time-varying explanatory variables along with their individual-specific mean over time.

variable has a positive coefficient, that is, firms having achieved their sales target are more likely to increase their investment. However, the effect seems to be of minor importance, as the coefficient is not significant and the result for the absolute forecast error remains significant.

[Insert Table 10 here]

The analysis has shown that firms' risk attitude is a significant driver of investment responses. In the case of firms' future investment propensity, both the current risk attitude and firms' expectations about their future risk attitude might be a driving factor. Thus, in Table 10, column 2, we do not control for firms' current risk attitude; rather, we control for the expected change in the risk attitude. As expected, the coefficient is positive and significant, reflecting that firms that are becoming less risk-averse are more likely to increase their investment.

One shortcoming of the analysis is that we cannot introduce firm-specific fixed effects due to the incidental parameters problem. Thus, to control for a firm's general forecasting pattern, we include its average forecast error (column 3). This captures whether a firm has been, on average, too pessimistic or too optimistic. However, these robustness tests do not change our main results, namely, that the absolute forecast error significantly undermines firms' willingness to invest.

Furthermore, to verify the asymmetric result for the forecast error, we run regressions only for those observations that show a negative (column 4) or positive (column 5) forecast error. Consistent with our previous results, we can confirm the asymmetric effect: the forecast error shows a negative and significant coefficient when we focus on the negative outcomes. However, the coefficient is insignificant if firms made a positive forecast error, that is, if the actual situation is better than expected.

4 Concluding Remarks

The recent economic environment has been characterized by a high level of uncertainty. A growing body of literature finds evidence for reduced investment, consumption and output growth due to higher uncertainty (Bloom 2009, Bloom et al. 2012, Kellogg 2014, Gilchrist et al. 2014). This paper contributes to this literature and focuses on the effects of firm-specific uncertainty on investment behavior. In particular, we document that ex-post realized forecast errors regarding the general situation of a firm are valid measures for firm-specific uncertainty, showing that firms respond asymmetrically to higher uncertainty, depending on the size and direction of the forecast error.

We proceed in three steps. First, using micro-level survey data of German firms obtained from the IWH risk climate survey, we derive firms' forecast errors, allowing approximation of uncertainty at the firm level. Larger forecast errors reveal reduced predictability and, thus, a higher level of uncertainty from the perspective of the individual firm (Jurado et al. 2015). The forecast errors obtained from the survey data can be seen as the firm-level counterpart to (aggregate) uncertainty. Using data from the IWH risk climate surveys offers several advantages. It spans a tranquil and a crisis period (2007–2011), it covers a large number of small and medium-sized firms, and it offers useful survey questions to study the effect of firm-specific forecast errors on firms' propensity to invest.

Second, calculating aggregate uncertainty measures out of the survey data, we find that cross-sectional uncertainty measures increase during economic downturns. This countercyclical pattern of uncertainty is in line with the related literature. Similar to the frequently observed counter-cyclicality of uncertainty at the macro level, we find that a countercyclical pattern of uncertainty captured by firms' forecast error prevails at the micro level. On average, firms make larger absolute forecast errors during crisis times. Furthermore, the pattern of firm-specific forecast errors reveals that firms adjust their expectations with a lag to economic developments. More firms made negative forecast errors at the beginning of the recent crisis, that is, when they expected the situation to be better than realized. In the further course of the crisis, a higher fraction of firms made positive forecast errors. This suggests that firms became too pessimistic following a sequence of bad news.

Third, we use these firm-specific forecast errors to evaluate the effect on investment. We find that firms making a larger absolute forecast error are more likely to decrease investment. The investment response is *asymmetric*, depending on the size and direction of the forecast error. If the forecast error is negative, that is, the actual situation is worse than expected, the investment propensity declines significantly. However, if the forecast errors are positive and increasing, that is, the realized situation is better than expected, firms do not adjust their investment upward. Thus, increased uncertainty seems to compensate for the realization of unexpectedly favorable economic conditions such that firms do not invest more. Given that the share of firms with positive forecast errors is higher in the aftermath of the crisis, this finding might explain the slow recovery following economic downturns. Firms remain too pessimistic after the peak of the crisis, which translates into positive forecast errors, making them more reluctant to increase investment.

To validate our results, we show that the forecast error as a measure of firm-specific uncertainty yields similar results as an ex-ante measure of uncertainty, which we obtain from the survey responses. We also document that both measures are highly correlated at the firm level. Furthermore, we give special emphasis to the role of firms' financial situation in periods of uncertainty. The results imply that forecast errors matter for investment responses, particularly for financially constrained firms. The quantitative effect of forecast errors loses significance if firms have a good financial situation. Consistent with previous evidence, this suggests that financial constraints dominate investment responses and reinforce the role played by uncertainty. Furthermore, it reveals that survey-based measures of firm-specific uncertainty are a valid complement to measures derived from financial market or balance sheet data, as they coincide in their information content. In addition, our results remain robust to a set of alternative robustness tests. Accounting for asymmetric effects of firm-specific uncertainty might be an interesting avenue for future research regarding the extension of quantitative macroeconomic models.

References

Arellano, C., Bai, Y., and Kehoe, P. (2012). Financial frictions and fluctuations in volatility, Staff Report 466, Federal Reserve Bank of Minneapolis.

Bachmann, R., Born, B., Elstner, S., and Grimme, C. (2013b). Time-Varying Business Volatility, Price Setting, and the Real Effects of Monetary Policy. CEPR Discussion Paper No. 9702.

Bachmann, R., and Elstner, S. (2015). Firm Optimism and Pessimism. *European Economic Review* 79: 297-325.

Bachmann, R., Elstner, S., and Sims, E. (2013a). Uncertainty and Economic Activity: Evidence from Business Survey Data. *American Economic Journal: Macroeconomics* 5(2): 217-249.

Banerjee, R., Kearns, J., and Lombardi, M. J. (2015). (Why) Is investment weak?. *BIS Quarterly Review March*.

Barkbu, B., Berkmen, P., Lukyantsau, P., Saksonovs, S., and Schoelermann, H. (2015). Investment in the Euro Area: Why Has It Been Weak? *IMF Working Paper No. 15/32.*

Bekaert, G., and Wu, G. (2000). Asymmetric Volatility and Risk in Equity Markets. *The Review of Financial Studies* 13(1): 1-42.

Bernanke, B.S. (1983). Irreversibility, Uncertainty, and Cyclical Investment. *Quarterly Journal of Economics* 97(1): 85-106.

Bloom, N. (2014). Fluctuations in Uncertainty. *Journal of Economic Perspectives* 28(2): 153-176.

Bloom, N., Floetotto, M., Jamovich, N., Saporta-Eksten, I., and Terry, S.J. (2012). Really Uncertain Business Cycles. National Bureau of Economic Research NBER Working Paper 18245. Cambridge MA.

Bloom, N. (2009). The Impact of Uncertainty Shocks. *Econometrica* 77(3): 623-685.

Bloom, N. (2007). Uncertainty and the Dynamics of R&D. *American Economic Review* 97(2): 250-255.

Bloom, N., Bond, S., and Van Reenen, J. (2007). Uncertainty and Investment Dynamics. *Review of Economic Studies* 74(2): 391-415.

Born, B., and Pfeifer, J. (2014). Policy risk and the business cycle. *Journal of Monetary Economics* 68: 68-85.

Buch, C.M., Buchholz, M., and Tonzer, L. (2015). Uncertainty, Bank Lending, and Bank-Level Heterogeneity. *IMF Economic Review* 63(4): 919-954.

Campbell, J.Y., and Hentschel, L. (1992). No news is good news. *Journal of Financial Economics* 31(3): 281-318.

Christiano, L. J., Motto, R., and Rostagno, M. (2014). Risk Shocks. *American Economic Review* 104(1), 27-65.

De Veirman, E., and Levin, A. (2016). Cyclical changes in firm volatility. *Journal of Money, Credit, and Banking, Forthcoming*.

Fernandez-Villaverde, J., Guerron-Quintana, P., Rubio-Ramirez, J. F., and Uribe, M. (2011). Risk Matters: The Real Effects of Volatility Shocks. *American Economic Review*, *101*(6), 2530-61.

Gennaioli, N., Shleifer, A., and Vishny, R. (2015). Neglected Risks: The Psychology of Financial Crises. *American Economic Review* 105(5): 310-314.

Gilchrist, S., Sim, J. W., and Zakrajsek, E. (2014). Uncertainty, Financial Frictions, and Investment Dynamics. Finance and Economics Discussion Series 2014-69, Board of Governors of the Federal Reserve System (U.S.).

Guiso, L., and Parigi, G. (1999). Investment and Demand Uncertainty. *The Quarterly Journal of Economics* 114(1): 185-227.

Guiso, L., Sapienza, P., and Zingales, L. (2013). Time Varying Risk Aversion. EIEF Working Papers Series 1322, Einaudi Institute for Economics and Finance (EIEF).

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

Kellogg, R. (2014). The Effect of Uncertainty on Investment: Evidence from Texas Oil Drilling. *American Economic Review* 104(6): 1698-1734.

Leahy, J., and Whited, D.T. (1996). The Effect of Uncertainty on Investment: Some Stylized Facts. *Journal of Money, Credit and Banking* 28(1): 64-83.

Mundlak, Y. (1978). On the pooling of time series and cross section data. *Econometrica: Journal of the Econometric Society*, 69-85.

OECD (2015). Lifting investment for higher sustainable growth. In: *OECD Economic Outlook* 2015(1): 205-79

Orlik, A., & Veldkamp, L. (2014). Understanding uncertainty shocks and the role of black swans. *NBER Working Paper No. 20445*

Panousi, V., and Papanikolaou, D. (2012). Investment, Idiosyncratic Risk, and Ownership. *Journal of Finance* 67(3): 1113–1148.

Rancière, R., Tornell, A., and Westermann, F. (2008). Systemic Crises and Growth. *The Quarterly Journal of Economics* 123 (1): 359-406.

Reinhart, C. M., and Rogoff, K. S. (2014). Recovery from financial crises: Evidence from 100 episodes. *American Economic Review* 104(5): 50-55.

Veldkamp, L. (2005). Slow boom, sudden crash. *Journal of Economic Theory* 124(2): 230-257.

Wooldridge, J. M. (2010). Correlated random effects models with unbalanced panels. *Mimeo.*

Zimmermann, K.F. (1986). On rationality of business expectations: A micro-analysis of qualitative responses. *Empirical Economics* 11: 23-40.

Appendix

Data Description

The data used in this paper come from the IWH risk climate survey. The data set is confidential and cannot be distributed to external researchers. It covers a large sample of small and medium-sized firms active in the German manufacturing sector. The survey waves were conducted bi-annually starting in 2007Q1 and ending in 2011Q3. For illustration, we have added a survey at the end of the paper. In the analysis, the ordering of the answers to questions four and five have been reversed in contrast to the ordering in the survey sheets to make it consistent with the ordering of the remaining survey questions and facilitate interpretation.

Variable Name	Measurement	Interpretation				Survey Question
Dependent variable						
Change in investment	--/-/0/+/++	--	Strong decrease	++	Strong increase	6
Risk attitude and forecast errors[22]						
Risk attitude	--/-/0/+/++	--	Very low willingness to take risks	++	Very high willingness to take risks	3
Expected change in risk	--/-/0/+/++	--	Strong decrease	++	Strong increase	4
Forecast error	-2/-1/0/1/ 2	-2	Situation worse than expected	2	Situation better than expected	Own calculation
Stability of expectations	--/-/0/+/++	--	Very instable	++	Very stable	2.1
Current situation						
Competition	--/-/0/+/++	--	Very bad	++	Very good	1.1.3a
Financing	--/-/0/+/++	--	Very bad	++	Very good	1.1.4a
Cost of material	--/-/0/+/++	--	Very bad	++	Very good	1.1.5a
German economy	--/-/0/+/++	--	Very bad	++	Very good	1.2a
Expected change						
Competition	--/-/0/+/++	--	Strong deterioration	++	Strong improvement	1.1.3b
Financing	--/-/0/+/++	--	Strong deterioration	++	Strong improvement	1.1.4b

[22] For a detailed description of the construction of our forecast errors, see the next section in the appendix.

Cost of material	--/-/0/+/++	--	Strong deterioration	++	Strong improvement	1.1.5b
German economy	--/-/0/+/++	--	Strong deterioration	++	Strong improvement	1.2b
Firm controls						
Revenue (see table 2)	5 categories	1	Revenue<250 k €	5	5 bn € <Revenue	10
Employees	5 categories	1	Employees<5	5	74<Employees	9
Sales target	--/-/0/+/++	--	Absolutely not achieved	++	Absolutely achieved	5
East/west dummy		0	Located in Western Germany	1	Located in Eastern Germany	

Sector Description

This table shows the sectors of the manufacturing industries based on the classification scheme WZ2008 of the German federal statistical office (www.destatis.de/EN).

Sector number	Sector name
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment

Construction of the Ifo business climate balance

In the Ifo business climate survey "the firms are asked to give their assessments of the **current business situation** and their **expectations** for the following six months. They can characterize their situation as "good", "satisfactorily" or "poor" and their business expectations for the next six months as "more favorable", "unchanged" or "more unfavorable". The replies are weighted according to the importance of the industry and aggregated accordingly. The **balance** value of the current business situation is the difference of the percentage shares of firms with responses "good" and "poor", the balance value of the expectations is the difference of the percentages of the responses "more favorable" and "more unfavorable". The **business climate balance** is a mean of both the balances of the business situation and the expectations."[23]

It is calculated using the formula:

$$business\ climate = \sqrt{(situation + 200)\ (expectations + 200)} \quad 200$$

"The Ifo business climate balances can fluctuate between extreme values of -100 (i.e., all responding firms appraise their situation as poor or expect business to become worse) and +100 (i.e., all responding firms assessed their situation as good or expect an improvement in their business)."

To re-construct the Ifo business climate balance using data from the IWH risk climate survey, we use the answers to the question on how firms evaluate their current overall situation and the expected development of the overall situation in the following six months. Since in the Ifo business climate survey, the firms only have the possibility to rate their situation as "good", "satisfactorily" and "poor" and their expectations as "more favorable", "unchanged" or "more favorable", we rescale our initial five category scale to three categories. The answers 1 and 2 were combined as "poor", the third category became "satisfactorily" and answers 4 and 5 are summarized as "good". We did the same for the expected development. Furthermore, we did not weigh the answers according to the importance of the industry.

[23] This description and more information regarding the Ifo business climate balance are available here: http://www.cesifo-group.de/w/45YCTv5Bp. The corresponding data can be found here: http://www.cesifo-group.de/w/AABWVtCn

Computation of the forecast error

Following Bachmann et al. (2013a), we compute forecast errors for each firm at each point in time from the survey responses. Each firm had to evaluate at time *t-1* its current overall situation on an ordinal scale. There were five possible answers ranging from "--" (very bad current situation) to "++" (very good situation). In time *t-1*, the firm also had to evaluate the expected change of the situation over the following six months. Again, the possible answers range from "--" to "++", with "--" representing a deterioration of the situation, "0" corresponding to no change, and a clear improvement coded with "++". To calculate the forecast error, we proceed as follows:

- For the calculation, we transfer the plus and minus scale into numbers: -- corresponds to 1; - to 2; 0 to 3; + to 4; ++ to 5.
- We recode the current situation to a simpler scale with three categories. "1" and "2" are recoded to "1" (bad situation), "3" to "2", and "4" and "5" are recoded to "3" (good situation).
- For consistency, we also recode the expected change to a simpler scale with three categories reflecting direction of change: "1" and "2" are recoded to "-1" (worsening), "3" to "0", and "4" and "5" are recoded to "1" (improvement).
- We then calculate in *t-1* the expected value for *t* (and we set the values back on scale if necessary) by summing the actual situation in *t-1* and the direction of expected change in *t-1*.
- We set the value for the expected situation back to scale if the current situation is evaluated as good (bad) and an improvement (deterioration) is expected. The reason is that this would imply the expected situation to be at a value of 0 (4), which is out of range of the three categories scale of the current situation going from 1 to 3. In this case, all values for the expected situation of 0 (4) are truncated to 1 (3), i.e. to „bad" („good").[24]
- The forecast error with five resulting categories is then calculated by subtracting the expected situation from the actual situation: *Forecast error (5 categories)= situation in t (3 categories) – expected situation for t in t-1 (3 categories).*
- This forecast error can have values from "-2" to "2", negative values mean that the realized situation is worse than expected. Positive values indicate that the actual situation is better than expected.

[24] We check if this truncation affects our regression result by excluding those firm-observations for which rescaling leads to a forecast error of zero. The results are only marginally affected both in terms of estimated coefficients and standard errors. They are available from the authors upon request.

<u>Calculation of the aggregate uncertainty measures</u>

Mean of absolute forecast errors

The aggregate measures derived from the firm-specific forecast error are calculated for any given quarter t by calculating, first, the mean of the absolute value of the firm-specific forecast error.

$$Mean\ abs.FE_t = mean(|forecast\ error_{i,t}|)$$

By taking the absolute value, a higher mean implies that on average more firms have made larger forecast errors irrespective of whether the forecast errors have been negative or positive.

Standard deviation of forecast errors

Second, we take the firm-specific forecast errors and compute the standard deviation.

$$SD\ FE_t = SD(forecast\ error_{i,t})$$

Dispersion of expectations

While the former measures are based on firm-specific forecast errors, the forecast dispersion (*FDISP*) measures the divergence of the firms' expected changes for each quarter *t*. The formula looks as follows:

$$FDISP_t = \sqrt{Frac_t^+ + Frac_t^- \quad (Frac_t^+ \quad Frac_t^-)^2}$$

$Frac_t^+$ = fraction of the participants that expect an enhancement.

$Frac_t^-$ = fraction of the participants that expect a worsening.

The higher the $FDISP_t$, the more diverging are the expectations. This forecast dispersion measure (*FDISP*) refers to Bachmann et al. (2013a).

Figures and Tables

Figure 1. Comparison of the IWH risk climate and the Ifo business climate

This figure uses the answers to the IWH risk climate surveys and follows the construction of the Ifo business climate balance to reproduce the corresponding series over time. The blue, solid line depicts the series for the business climate balance obtained from the IWH risk climate survey (*IWH RCI balance*). The red, dotted line shows the original series of the Ifo business climate balance (*Ifo BCI balance*). The Ifo data are available on a monthly frequency while the IWH surveys are only conducted twice a year. To obtain a biannual series for the Ifo balance, we use data for March and September. The Ifo business climate balance can take values between -100 and + 100 (-100: every single firm rated the current situation as bad and expected a further worsening; +100: every firm rated the situation as good and expected a further enhancement). The Ifo business climate survey data are obtained from the CESifo Group Munich: http://www.cesifo-group.de/w/45YCTv5Bp

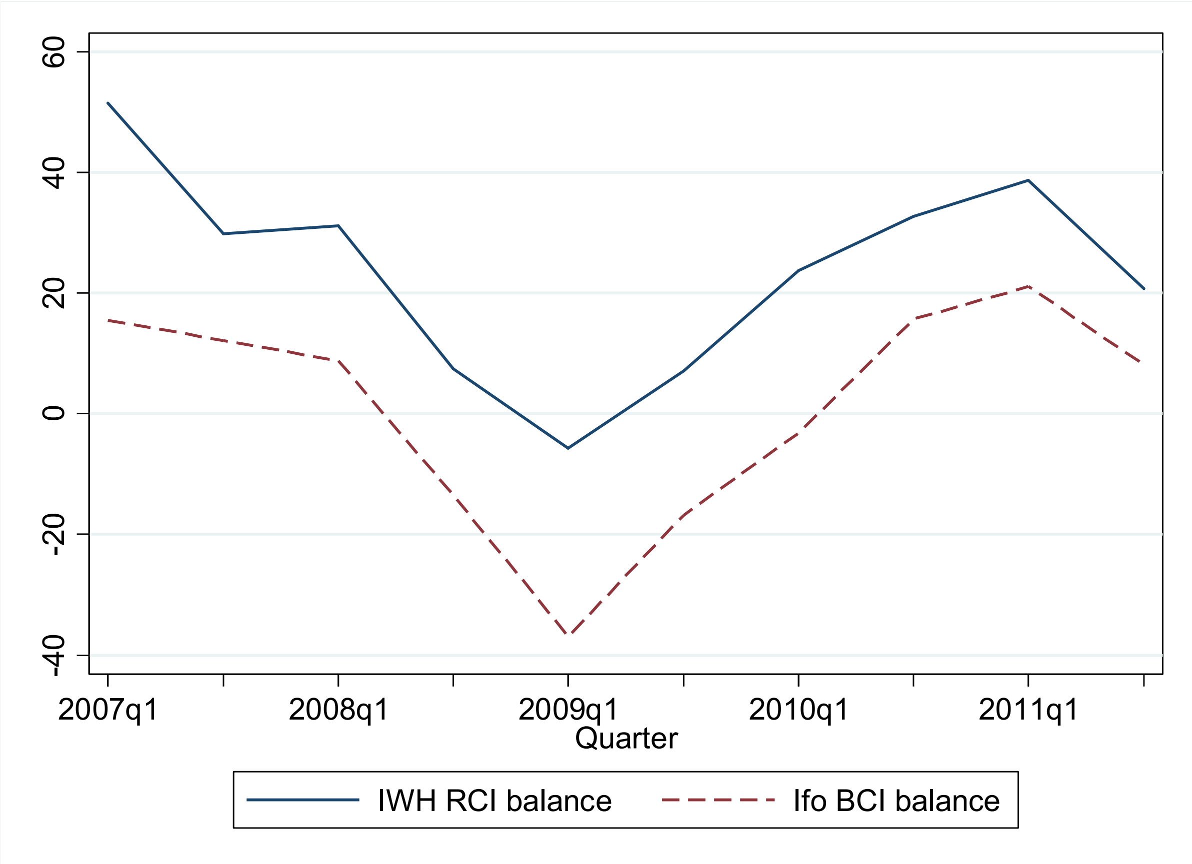

Figure 2. Different uncertainty measures across time

This figure shows the three different measures for aggregate uncertainty which are calculated as follows: First, we compute firm's idiosyncratic forecast error (FE). It compares the expected situation with the realized situation one period later. Second, we take the mean of the absolute forecast error (*Mean abs. FE*, grey dotted line) and the standard deviation across these idiosyncratic forecast errors (*SD FE*, red dashed line). Alternatively, we show the forecast dispersion (*FDISP*, blue solid line) which measures the dispersion of expectations across all firms in each period (Bachmann et al. 2013a). All of these series are standardized (zero mean, unit standard deviation). The green dashed line is the stock market volatility as obtained from Bloom (2014).

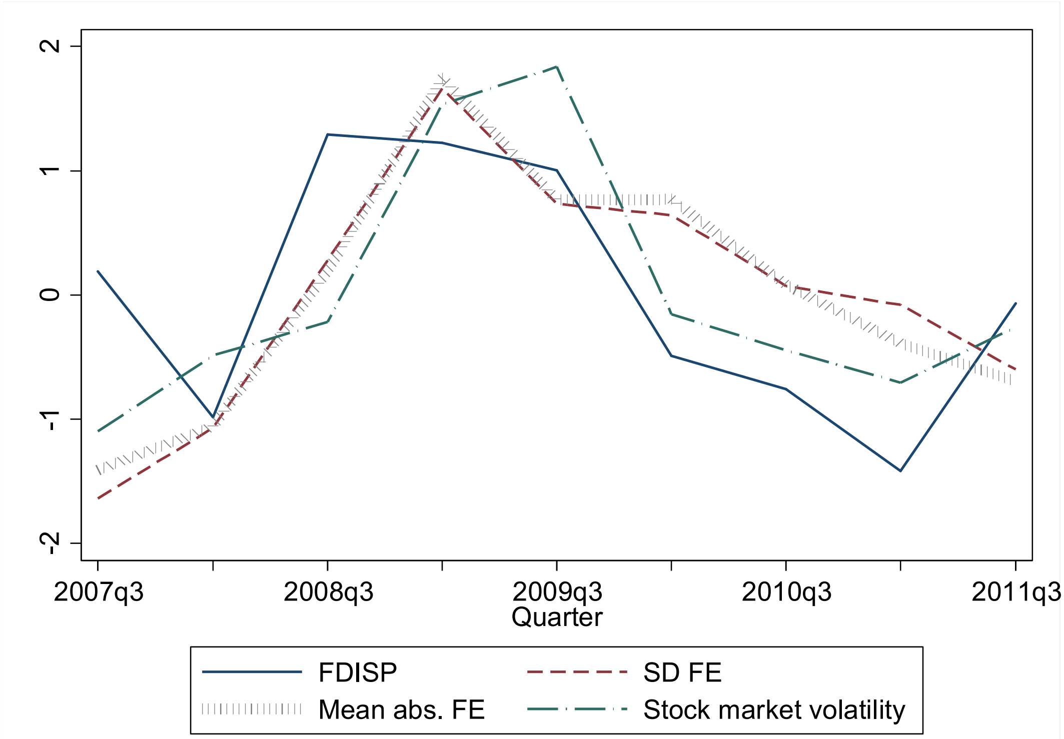

Figure 3. Evolution of mean absolute forecast error (5 categories) over time for different firm sizes

This figure shows the mean absolute forecast error of the firms' overall situation over time. The mean absolute forecast error is calculated by taking the mean of the absolute values of firms' idiosyncratic forecast errors. The firms' idiosyncratic forecast error is the difference between the firm's actual situation and the previously expected situation. The series is depicted by subcategory of firm size. The firms can be divided in five different subcategories: 1-4, 5-24, 25-49, 50-74, 75 and more employees.

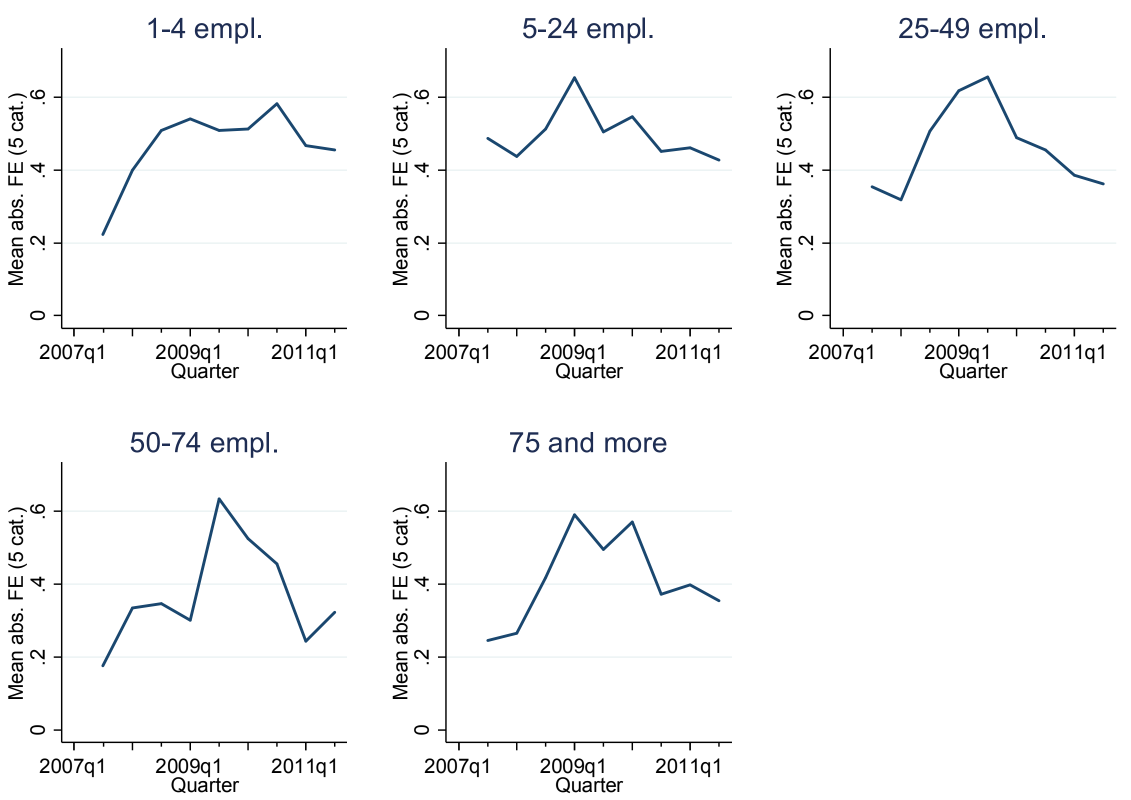

Figure 4. Evolution of mean absolute forecast error (5 categories) over time for different firm revenues

This figure shows the mean absolute forecast error of the overall situation over time. The mean absolute forecast error is calculated by taking the mean of the absolute values of firms' idiosyncratic forecast errors. The firms' idiosyncratic forecast error is the difference between the firm's actual situation and the previously expected situation. The series is depicted by subcategory of firm revenue. The firms can be divided in five different subcategories: 0-249 thousand Euros, 250-499 thousand Euros, 500-999 thousand Euros, 1-5 million Euros, and more than five million Euros.

Figure 5. Survey based uncertainty measures and investment

This figure shows the pattern of the aggregate uncertainty measures derived from the survey responses and the evolution in the volume of equipment investment (percentage change). The standardized uncertainty measures (left axis) comprise the mean absolute forecast error (grey, dotted line) and the standard deviation of firms' forecast errors (red, dashed line). The change in the investment volume is depicted by the green, solid line (right axis applies). Information on the volume of equipment investment in billion Euros for the non-governmental sector is obtained from the German federal statistical office (www.destatis.de/EN).

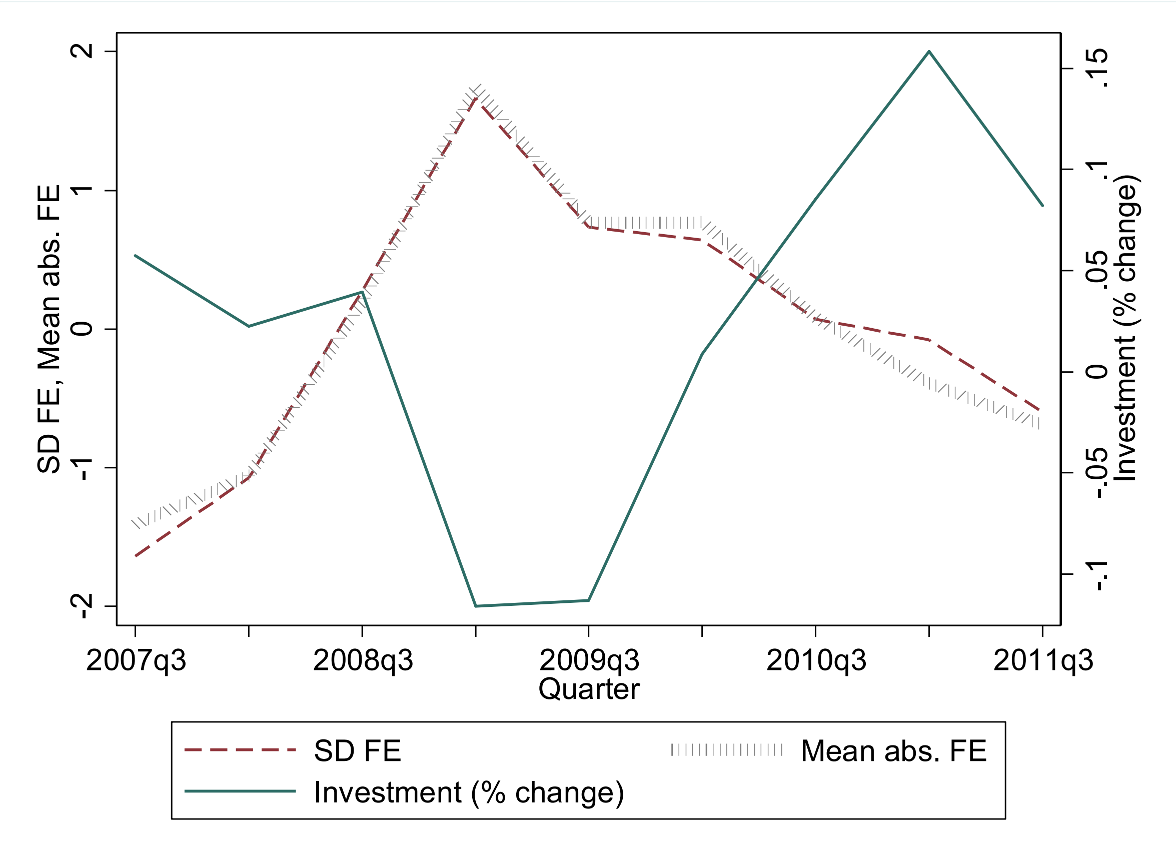

Figure 6. Planned investment change by size of forecast error regarding overall economic situation

This figure shows the distribution of firms' planned changes in investment for different sizes of the idiosyncratic forecast error based on the question on the firm's overall economic situation. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). The forecast error measures the difference between the actually realized situation in *t* and the expected economic situation in *t-1* for period *t*. Negative values signal that the realized situation was worse than expected (FE -2 and FE -1), positive values signal that the realized situation was better than expected (FE 1 and FE 2).

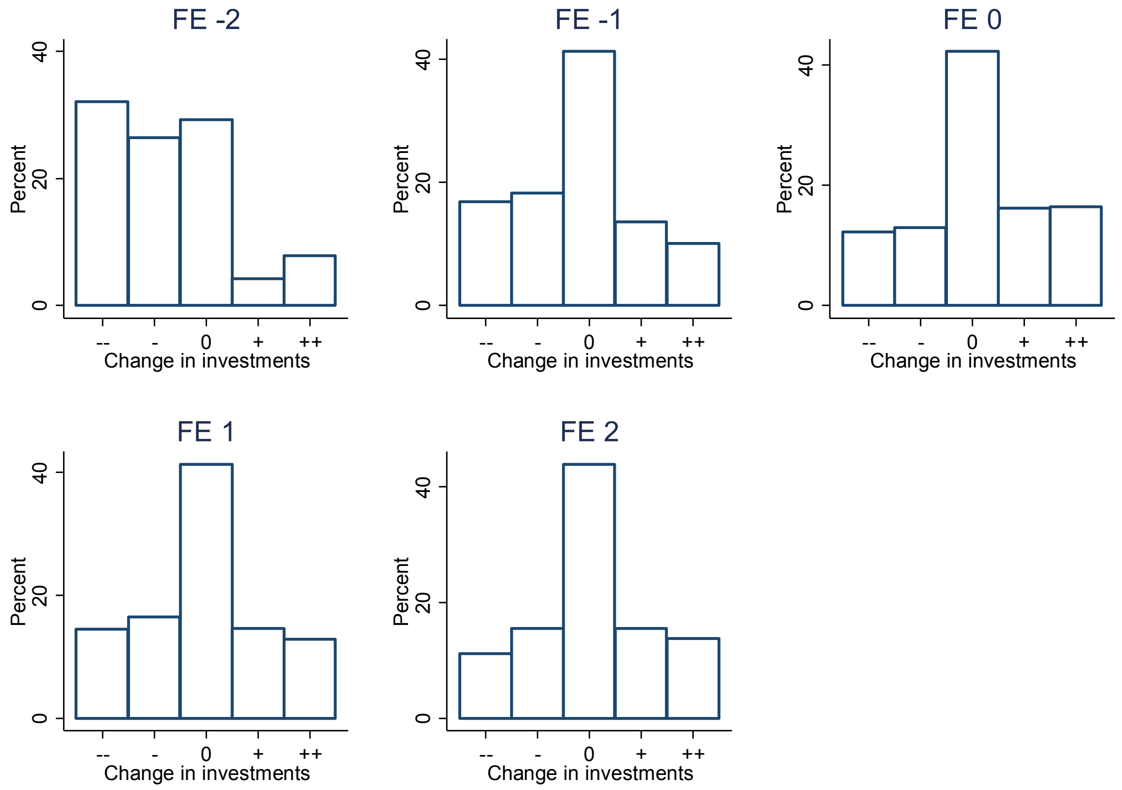

Figure 7. Planned investment change by expected change of the firms' overall economic situation

This figure shows the distribution of firms' planned changes in investment for different expected changes of the firm's overall economic situation. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). The expected change in the firm's overall economic situation is ordered in five categories: minus stands for a (strong) deterioration (-/--), zero for no change (0), and plus signals a (strong) improvement of the overall situation (+/++).

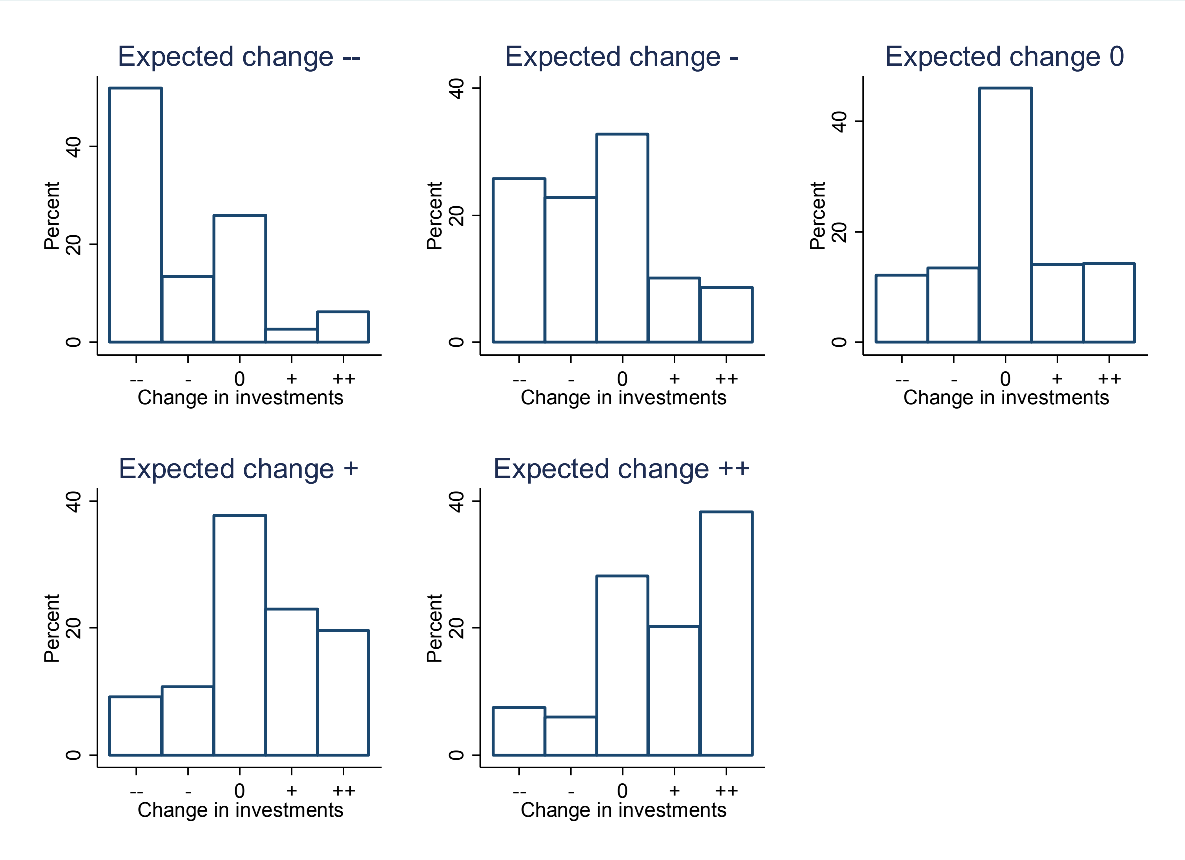

Figure 8. Planned investment change by risk attitude

This figure shows the distribution of firms' planned changes in investment for different expected changes of a firm's risk attitude. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). The risk attitude is defined as follows: minus indicates that they have a (very) low risk attitude (-/--), zero indicates that they have a moderate risk attitude (0), plus stands for a (very) high risk attitude (+/++).

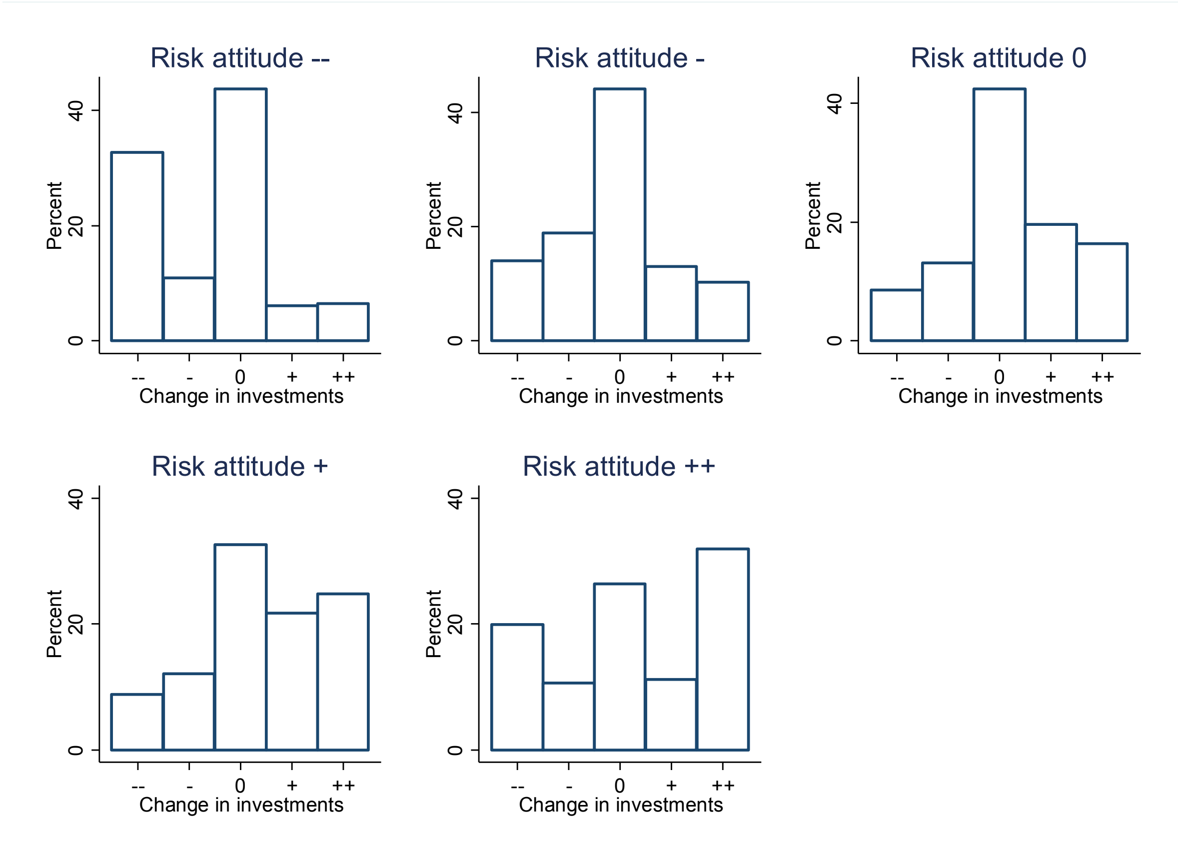

Figure 9. Planned investment change by financing situation

This figure shows the distribution of firms' planned changes in investment for different assessments of the firm's financing situation. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). The financing situation is defined as follows: lower values indicated that firms assess their financing situation as (very) bad (--/-), zero indicates that the financing situation is reasonable (0), higher values stand for a (very) good financing situation (+/++) .

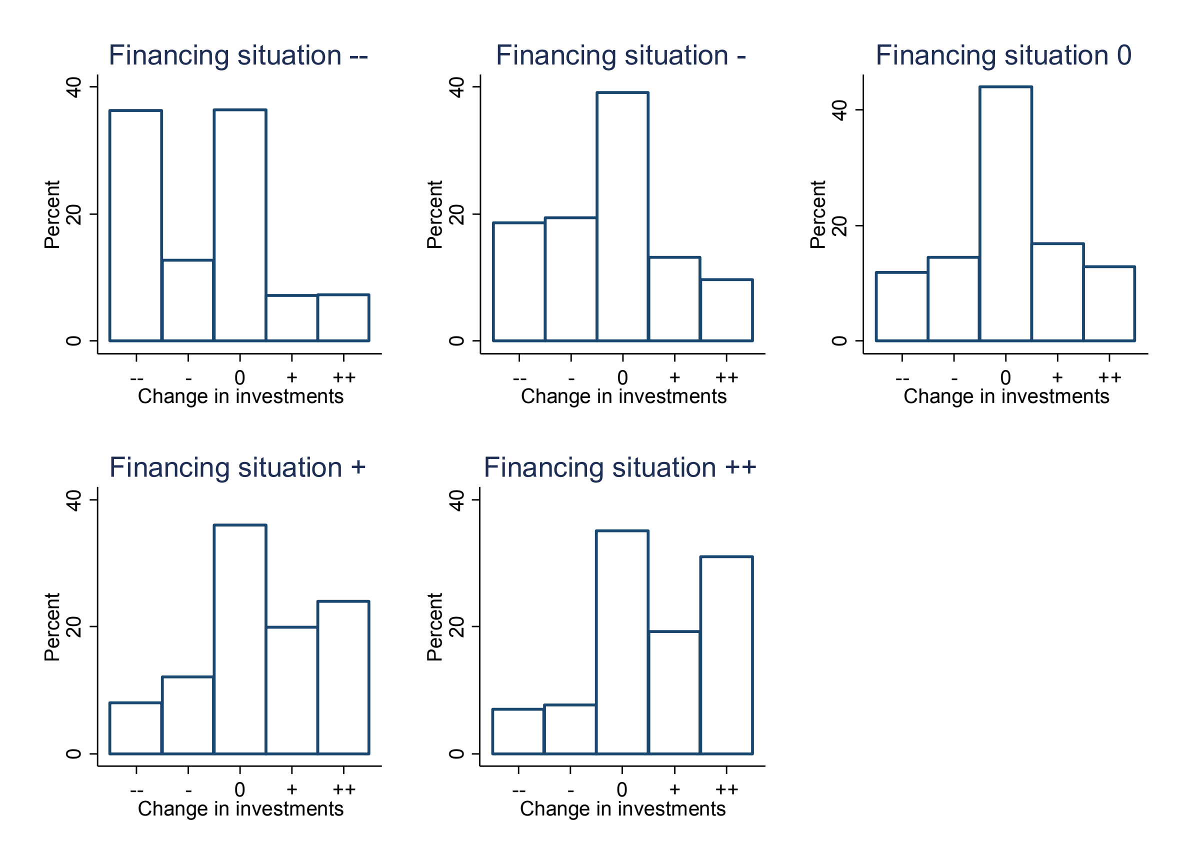

Figure 10. Marginal effect of the absolute forecast error conditional on firms' financing situation

This figure shows the marginal effect (dots) of the absolute forecast error on the firm's probability to strongly decrease investment (lowest outcome category) conditional on its financing situation. The financing situation is either bad reflected by a minus (-), middle (0), or good depicted by a plus (+). The marginal effects are surrounded by 95% confidence intervals.

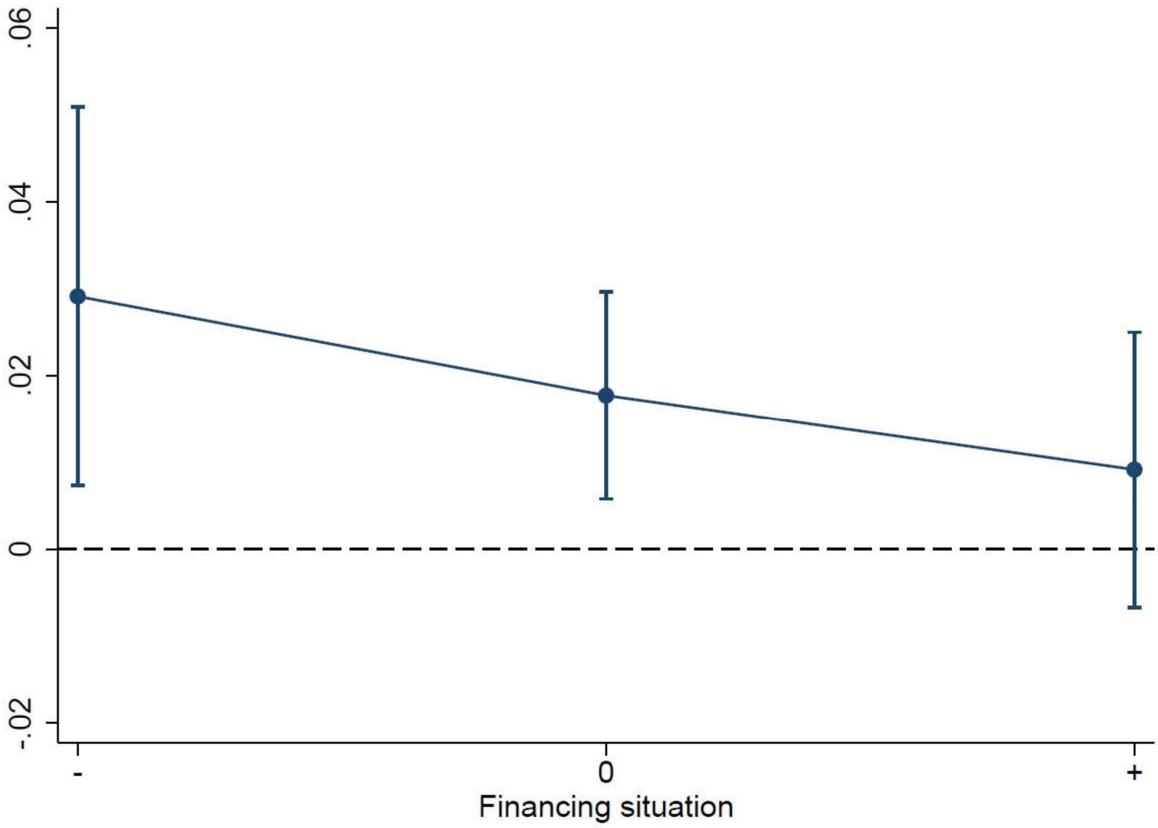

Table 1. Number of firms by subcategory of employees and wave

This table shows the number of firms that have participated in the survey for different subcategories of firm size measured by the number of employees across the different waves from 2007Q1 to 2011Q3.

Quarter	Emp<4	5≤Emp≤24	25≤Emp≤49	50≤Emp≤74	Emp≥75	n.a.	total
2007q1	21	157	114	43	102	5	442
2007q3	103	286	117	31	115	9	661
2008q1	141	340	142	51	133	41	848
2008q3	163	374	145	41	148	135	1,006
2009q1	232	508	140	49	147	136	1,212
2009q3	222	497	137	51	121	154	1,182
2010q1	163	260	518	132	39	129	1,241
2010q3	243	513	120	54	116	115	1,161
2011q1	246	558	133	54	137	173	1,301
2011q3	249	492	146	41	127	157	1,212

Table 2. Number of firms by subcategory of revenue and wave

This table shows the number of firms that have participated in the survey for different subcategories of revenues across the different waves from 2007Q1 to 2011Q3.

Quarter	Rev<250 k €	250≤Rev≤499 k €	500≤Rev≤999 k €	1≤Rev≤5 mn €	Rev>5 mn €	n.a.	total
2007q1	13	19	28	200	175	7	442
2007q3	58	61	80	239	197	26	661
2008q1	85	88	91	288	238	58	848
2008q3	101	105	117	288	237	158	1,006
2009q1	107	132	172	384	266	151	1,212
2009q3	113	139	157	368	222	183	1,182
2010q1	138	148	206	355	209	185	1,241
2010q3	149	146	183	345	198	140	1,161
2011q1	140	149	189	388	245	190	1,301
2011q3	131	152	180	354	218	177	1,212

Table 3. Summary statistics for firms' forecast error

This table shows the distribution of firms by the size of the forecast error derived from the question on the overall situation of the firm. The forecast error is divided into five categories and ranges from FE -2 (realized situation worse than expected) to FE 2 (realized situation better than expected). The columns show the percentage share of firms which made the respective forecast error for each wave and, in the lowest row, across the whole sample period from 2007Q3 to 2011Q3. Since 2007q1 has been the first wave and we do not have expectations for the preceding quarter, the forecast errors can only be calculated starting from 2007Q3.

Quarter	Wave	FE -2	FE -1	FE 0	FE 1	FE 2	total
2007q1	1	.	.	.	.	.	.
2007q3	2	2.8	19.2	69.2	8.4	0.5	100
2008q1	3	1.4	16.1	66.3	14.1	2.0	100
2008q3	4	**5.2**	**21.4**	58.8	12.9	1.7	100
2009q1	5	**6.9**	**24.9**	47.6	18.3	2.3	100
2009q3	6	3.2	16.2	53.3	**24.1**	**3.2**	100
2010q1	7	1.7	19.2	52.6	**22.4**	**4.1**	100
2010q3	8	2.5	18.5	57.8	18.8	2.4	100
2011q1	9	2.5	17.6	63.1	13.2	3.6	100
2011q3	10	3.1	19.2	64.6	11.1	1.9	100
2007q3-2011q3	**total**	**3.3**	**19.1**	**58.3**	**16.7**	**2.6**	**100**

Table 4: Baseline regression

a) Regression results

	(1)	(2)	(3)	(4)
Current situation				
Competition	0.082***	0.075***	0.083***	0.075***
	(0.026)	(0.028)	(0.026)	(0.027)
Financing	0.190***	0.197***	0.181***	0.187***
	(0.025)	(0.026)	(0.025)	(0.026)
Cost of material	-0.107***	-0.115***	-0.068***	-0.072***
	(0.024)	(0.026)	(0.026)	(0.027)
German economy	0.198***	0.204***	0.122***	0.125***
	(0.025)	(0.027)	(0.028)	(0.029)
Expected change				
Competition	0.090***	0.105***	0.081**	0.093***
	(0.032)	(0.034)	(0.032)	(0.034)
Financing	0.126***	0.116***	0.123***	0.111***
	(0.033)	(0.034)	(0.033)	(0.035)
Cost of material	-0.053**	-0.065**	-0.026	-0.035
	(0.025)	(0.026)	(0.025)	(0.027)
German economy	0.053*	0.047	0.050*	0.041
	(0.027)	(0.029)	(0.029)	(0.031)
Firm controls				
Revenue	-0.058***	-0.052***	-0.046***	-0.040**
	(0.016)	(0.017)	(0.016)	(0.017)
Risk and FE				
Risk attitude	0.185***	0.187***	0.188***	0.188***
	(0.021)	(0.022)	(0.021)	(0.022)
Absolute FE	-0.088***	-0.087***	-0.080**	-0.080**
	(0.031)	(0.033)	(0.032)	(0.033)
Cutoff				
Cutoff1	0.774***	0.659***	0.561***	0.329
	(0.139)	(0.171)	(0.172)	(0.208)
Cutoff2	1.402***	1.280***	1.197***	0.958***
	(0.140)	(0.171)	(0.172)	(0.207)
Cutoff3	2.582***	2.462***	2.390***	2.154***
	(0.145)	(0.176)	(0.176)	(0.210)
Cutoff4	3.189***	3.079***	3.000***	2.773***
	(0.148)	(0.178)	(0.178)	(0.213)
Observations	3,636	3,308	3,636	3,308
Pseudo R-squared	0.07	0.07	0.07	0.08
Sector-fixed effects	-	x	-	x
Time-fixed effects	-	-	x	x

Dependent variable is the change in investment measured on an ordinal 5 categories scale. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). Independent variable is the forecast error in absolute terms, such that higher values indicate a larger forecast error, that is the actual situation is different than the expected one. We control for a set of variables (competition, financing, cost of material, German economy) regarding the current situation and the expected change, both are also measured on a 5 category scale, where the lowest outcome stands for a very bad situation/strong worsening and the highest outcome for a very good situation/strong improvement. Furthermore, we control for the revenue and the risk attitude. Across the four different specifications, we include no fixed effects, sector fixed effects, time fixed effects and both. The time span reaches from 2007 until 2011. The standard errors are clustered by firm and depicted in parentheses. The p-values are as follows: *** p<0.01, ** p<0.05, * p<0.1.

b) Marginal effects of forecast error

This table shows marginal effects of the absolute forecast error on investment across all outcome categories of investment. The marginal effects are shown for the regression model without any fixed effects (Table 4a, column 1). The standard errors are clustered by firm and depicted in parentheses. The p-values are as follows: *** p<0.01, ** p<0.05, * p<0.1.

Outcome category	(1)	(2)	(3)	(4)	(5)
Absolute forecast error	0.017***	0.010***	0.001	-0.010***	-0.018***
	(0.006)	(0.004)	(0.001)	(0.003)	(0.006)
		0	0	0	0
Observations	3,636	3,636	3,636	3,636	3,636

Table 5: Direction of the forecast error

a) Regression results

	(1)	(2)	(3)	(4)
Current situation				
Competition	0.075***	0.066**	0.074***	0.064**
	(0.026)	(0.027)	(0.026)	(0.027)
Financing	0.186***	0.192***	0.176***	0.180***
	(0.025)	(0.026)	(0.025)	(0.026)
Cost of material	-0.109***	-0.116***	-0.067***	-0.070**
	(0.024)	(0.026)	(0.026)	(0.027)
German economy	0.193***	0.199***	0.113***	0.113***
	(0.025)	(0.027)	(0.028)	(0.029)
Expected change				
Competition	0.095***	0.112***	0.087***	0.101***
	(0.032)	(0.034)	(0.032)	(0.034)
Financing	0.129***	0.120***	0.126***	0.116***
	(0.033)	(0.034)	(0.033)	(0.035)
Cost of material	-0.051**	-0.062**	-0.024	-0.033
	(0.025)	(0.026)	(0.026)	(0.027)
German economy	0.055**	0.048*	0.056*	0.048
	(0.028)	(0.029)	(0.029)	(0.031)
Firm controls				
Revenue	-0.057***	-0.051***	-0.044***	-0.038**
	(0.016)	(0.017)	(0.016)	(0.017)
Risk and FE				
Risk attitude	0.187***	0.190***	0.191***	0.192***
	(0.021)	(0.022)	(0.021)	(0.022)
Forecast error < 0	-0.160***	-0.173***	-0.161***	-0.177***
	(0.039)	(0.041)	(0.040)	(0.041)
Forecast error ≥0	-0.010	0.008	0.009	0.026
	(0.039)	(0.041)	(0.040)	(0.042)
Cutoff				
Cutoff1	0.765***	0.655***	0.534***	0.303
	(0.139)	(0.171)	(0.173)	(0.208)
Cutoff2	1.394***	1.277***	1.172***	0.935***
	(0.140)	(0.171)	(0.173)	(0.207)
Cutoff3	2.576***	2.461***	2.367***	2.134***
	(0.145)	(0.176)	(0.176)	(0.211)
Cutoff4	3.184***	3.079***	2.978***	2.755***
	(0.148)	(0.178)	(0.179)	(0.213)
Observations	3,636	3,308	3,636	3,308
Pseudo R-squared	0.07	0.07	0.08	0.08
Sector-fixed effects	-	x	-	x
Time-fixed effects	-	-	x	x

Dependent variable is the change in investment measured on an ordinal 5 categories scale. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). Independent variable is the absolute forecast error, high values of this forecast error mean that the situation is different than expected a period before, whereas we make a distinction between a forecast error that is greater than or equal to zero and negative forecast errors. We control for a set of variables (competition, financing, cost of material, German economy) regarding the current situation and the expected change, both are also measured on a 5 category scale, where the lowest outcome stands for a very bad situation/strong worsening and the highest outcome for a very good situation/strong improvement. Furthermore we control for the revenue and the risk attitude. We run four different specifications including no fixed effects, sector fixed effects, time fixed effects and both. The time span reaches from 2007 until 2011. The standard errors are clustered by firm and depicted in parentheses. The p-values are as follows: *** p<0.01, ** p<0.05, * p<0.1.

b) Marginal effects of forecast error

This table shows marginal effects of the forecast error on investment across all outcome categories of investment for negative forecast errors and zero/positive forecast errors separately. The marginal effects are shown for the regression model without any fixed effects (Table 5a, column 1). The standard errors are clustered by firm and depicted in parentheses. The p-values are as follows: *** p<0.01, ** p<0.05, * p<0.1.

Outcome category	(1)	(2)	(3)	(4)	(5)
Forecast error < 0	0.032***	0.018***	-0.000	-0.017***	-0.032***
	(0.008)	(0.004)	(0.001)	(0.004)	(0.008)
Forecast error ≥0	0.002	0.001	0.000	-0.001	-0.002
	(0.007)	(0.004)	(0.001)	(0.004)	(0.008)
Observations	3,636	3,636	3,636	3,636	3,636

Table 6: Stability of expectations as ex-ante firm-specific uncertainty

a) Regression results

	(1)	(2)	(3)	(4)
Current situation				
Competition	0.050***	0.048**	0.049***	0.048**
	(0.019)	(0.020)	(0.019)	(0.020)
Financing	0.118***	0.123***	0.114***	0.119***
	(0.018)	(0.019)	(0.018)	(0.019)
Cost of material	-0.089***	-0.101***	-0.047**	-0.055***
	(0.018)	(0.019)	(0.018)	(0.020)
German economy	0.186***	0.188***	0.116***	0.111***
	(0.018)	(0.020)	(0.020)	(0.021)
Expected change				
Competition	0.060***	0.064***	0.054**	0.055**
	(0.022)	(0.024)	(0.022)	(0.024)
Financing	0.158***	0.139***	0.151***	0.131***
	(0.024)	(0.026)	(0.024)	(0.026)
Cost of material	-0.039**	-0.035*	-0.010	-0.003
	(0.018)	(0.020)	(0.019)	(0.020)
German economy	0.057***	0.057***	0.048**	0.047**
	(0.019)	(0.020)	(0.020)	(0.022)
Firm controls				
Revenue	-0.060***	-0.061***	-0.053***	-0.053***
	(0.011)	(0.013)	(0.012)	(0.013)
Risk and FE				
Risk attitude	0.169***	0.172***	0.168***	0.170***
	(0.015)	(0.016)	(0.015)	(0.016)
Stability of expectations	0.186***	0.189***	0.180***	0.184***
	(0.019)	(0.020)	(0.019)	(0.020)
Cutoff				
Cutoff1	1.154***	1.033***	0.824***	0.519***
	(0.098)	(0.123)	(0.123)	(0.161)
Cutoff2	1.742***	1.629***	1.421***	1.125***
	(0.099)	(0.124)	(0.124)	(0.162)
Cutoff3	2.898***	2.779***	2.589***	2.289***
	(0.103)	(0.128)	(0.126)	(0.164)
Cutoff4	3.509***	3.388***	3.202***	2.901***
	(0.106)	(0.131)	(0.129)	(0.167)
Observations	6,959	5,991	6,959	5,991
Pseudo R-squared	0.07	0.07	0.08	0.08
Sector-fixed effects	-	x	-	x
Time-fixed effects	-	-	x	x

Dependent variable is the change in investment measured on an ordinal 5 categories scale. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). Independent variable is the stability of expectations (5 categories), where small values signal that the situation is instable and high values stand for a stable situation. We control for a set of variables (competition, financing, cost of material, German economy) regarding the current situation and the expected change, both are also measured on a 5 category scale, where the lowest outcome stands for a very bad situation/strong worsening and the highest outcome for a very good situation/strong improvement. Furthermore we control for the revenue and the risk attitude. Across the four different specifications, we include no fixed effects, sector fixed effects, time fixed effects and both. The time span reaches from 2007 until 2011. The standard errors are clustered by firm and depicted in parentheses. The p-values are as follows: *** p<0.01, ** p<0.05, * p<0.1.

b) Marginal effects of stability of expectations

This table shows marginal effects of the ex-ante firm-specific uncertainty measure captured by the stability of expectations on investment across all outcome categories of investment. The marginal effects are shown for the regression model without any fixed effects (Table 6a, column 1). The standard errors are clustered by firm and depicted in parentheses. The p-values are as follows: *** p<0.01, ** p<0.05, * p<0.1.

Outcome category	(1)	(2)	(3)	(4)	(5)
Stability of expectations	-0.036***	-0.019***	-0.003***	0.019***	0.040***
	(0.004)	(0.002)	(0.001)	(0.002)	(0.004)
Observations	6,959	6,959	6,959	6,959	6,959

Table 7: Stability of expectations as dependent variable

	(1)	(2)	(3)	(4)
Current situation				
Competition	0.213***	0.214***	0.214***	0.215***
	(0.029)	(0.032)	(0.030)	(0.032)
Financing	0.277***	0.282***	0.274***	0.278***
	(0.027)	(0.028)	(0.027)	(0.028)
Cost of material	0.034	0.031	0.046*	0.044
	(0.025)	(0.026)	(0.026)	(0.028)
German economy	0.268***	0.263***	0.252***	0.249***
	(0.027)	(0.029)	(0.030)	(0.032)
Current situation				
Competition	0.080***	0.073**	0.074**	0.068**
	(0.031)	(0.032)	(0.031)	(0.032)
Financing	0.075**	0.066*	0.074**	0.065*
	(0.033)	(0.034)	(0.033)	(0.034)
Cost of material	-0.043*	-0.055**	-0.030	-0.043
	(0.025)	(0.027)	(0.026)	(0.027)
German economy	0.054*	0.069**	0.047	0.061*
	(0.029)	(0.031)	(0.030)	(0.032)
Firm controls				
Revenue	0.105***	0.113***	0.109***	0.115***
	(0.018)	(0.019)	(0.018)	(0.020)
Risk and FE				
Risk attitude	0.091***	0.104***	0.091***	0.103***
	(0.023)	(0.024)	(0.023)	(0.024)
Forecast error	-0.129***	-0.111***	-0.125***	-0.107***
	(0.034)	(0.035)	(0.034)	(0.036)
Cutoff				
Cutoff1	0.998***	0.720***	0.966***	0.679***
	(0.150)	(0.186)	(0.183)	(0.228)
Cutoff2	2.188***	1.938***	2.164***	1.905***
	(0.158)	(0.193)	(0.192)	(0.235)
Cutoff3	3.655***	3.416***	3.634***	3.387***
	(0.168)	(0.203)	(0.200)	(0.244)
Cutoff4	5.179***	4.962***	5.159***	4.933***
	(0.182)	(0.218)	(0.214)	(0.259)
Observations	3,604	3,279	3,604	3,279
Pseudo R-squared	0.13	0.13	0.13	0.14
Sector-fixed effects	-	x	-	x
Time-fixed effects	-	-	x	x

Dependent variable is the stability of expectations measured on an ordinal 5 categories scale. (Very) unstable expectations correspond to minus (-/--), zero stands for moderate stability (0), and plus for (very) stable expectations (+/++). Independent variable is the forecast error in absolute terms, such that higher values indicate a larger forecast error, that is the actual situation is different than the expected one. We control for a set of variables (competition, financing, cost of material, German economy) regarding the current situation and the expected change, both are also measured on a 5 category scale, where the lowest outcome stands for a very bad situation/strong worsening and the highest outcome for a very good situation/strong improvement. Furthermore, we control for the revenue and the risk attitude. Across the four different specifications, we include no fixed effects, sector fixed effects, time fixed effects and both. The time span reaches from 2007 until 2011. The standard errors are clustered by firm and depicted in parentheses. The p-values are as follows: *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Interaction between forecast error and financial constraints

Marginal effects of forecast error conditional on financial constraint

This table shows marginal effects of the absolute forecast error on investment conditional on the realization of the variable for financial constraint across all outcome categories of investment. The marginal effects are shown for the regression model without any fixed effects. The standard errors are clustered by firm and depicted in parentheses. The p-values are as follows: *** p<0.01, ** p<0.05, * p<0.1.

Outcome category	(1)	(2)	(3)	(4)	(5)
Financing = 1	0.029***	0.013***	-0.008**	-0.015***	-0.019**
	(0.011)	(0.005)	(0.003)	(0.006)	(0.008)
Financing = 2	0.018***	0.011***	0.000	-0.011***	-0.018***
	(0.006)	(0.004)	(0.001)	(0.004)	(0.006)
Financing = 3	0.009	0.008	0.004	-0.006	-0.015
	(0.008)	(0.007)	(0.004)	(0.005)	(0.013)
Observations	3,636	3,636	3,636	3,636	3,636

Table 9: Robustness tests I

	Ologit	Random effects Oprobit	Clustering by sector	Wave 3-10	Correlated random effects model
	(1)	(2)	(3)	(4)	(5)
Current situation					
Competition	0.137***	0.096***	0.076*	0.080***	0.095***
	(0.045)	(0.028)	(0.039)	(0.027)	(0.035)
Financing	0.326***	0.213***	0.193***	0.181***	0.231***
	(0.043)	(0.027)	(0.027)	(0.025)	(0.038)
Cost of material	-0.197***	-0.128***	-0.113***	-0.116***	-0.154***
	(0.042)	(0.026)	(0.021)	(0.025)	(0.032)
German economy	0.345***	0.214***	0.202***	0.203***	0.173***
	(0.044)	(0.027)	(0.042)	(0.026)	(0.032)
Expected change					
Competition	0.168***	0.089***	0.102***	0.107***	0.080**
	(0.057)	(0.034)	(0.032)	(0.033)	(0.040)
Financing	0.234***	0.130***	0.121***	0.131***	0.098**
	(0.058)	(0.035)	(0.030)	(0.033)	(0.041)
Cost of material	-0.100**	-0.049*	-0.065***	-0.052**	-0.021
	(0.044)	(0.027)	(0.016)	(0.026)	(0.032)
German economy	0.103**	0.068**	0.044*	0.042	0.071**
	(0.048)	(0.029)	(0.025)	(0.028)	(0.033)
Firm controls					
Revenue	-0.105***	-0.065***	-0.061***	-0.059***	-0.042
	(0.027)	(0.017)	(0.020)	(0.016)	(0.053)
Risk and FE					
Risk attitude	0.316***	0.207***	0.188***	0.184***	0.205***
	(0.036)	(0.022)	(0.024)	(0.021)	(0.033)
Absolute FE	-0.163***	-0.093***	-0.085**	-0.084***	-0.074*
	(0.054)	(0.033)	(0.033)	(0.032)	(0.038)
Cutoff					
Cutoff1	1.388***	0.866***	0.732***	0.764***	0.768***
	(0.245)	(0.149)	(0.216)	(0.144)	(0.183)
Cutoff2	2.486***	1.546***	1.350***	1.401***	1.397***
	(0.246)	(0.151)	(0.213)	(0.144)	(0.184)
Cutoff3	4.455***	2.827***	2.529***	2.589***	2.578***
	(0.258)	(0.160)	(0.211)	(0.150)	(0.188)
Cutoff4	5.513***	3.488***	3.143***	3.191***	3.187***
	(0.264)	(0.166)	(0.222)	(0.152)	(0.191)
Observations	3,636	3,636	3,308	3,453	3,636
Pseudo R-squared	0.07	-	0.07	0.07	0.07
Sector-fixed effects	-	-	-	-	-
Time-fixed effects	-	-	-	-	-

This table shows various robustness tests for the baseline model (equation 1). Dependent variable is the change in investment measured on an ordinal 5 categories scale. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). Independent variable is the absolute forecast error. We control for a set of variables (competition, financing, cost of material, German economy) regarding the current situation and the expected change, both are also measured on a 5 category scale, where the lowest outcome stands for a very bad situation/strong worsening and the highest outcome for a very good situation/strong improvement. Furthermore, we control for the revenue and the risk attitude. Regression results based on an ordered logit model are shown in column 1. In column 2, we use a random effects ordered probit model. In column 3, standard errors are not clustered by firm but by sector. The sample starts beginning from wave 3 in column 4.The final column shows results from a correlated random effects model. No fixed effects are included. The time span reaches from 2007 until 2011 if not indicated otherwise. The standard errors are clustered by firm if not indicated otherwise and depicted in parentheses. The p-values are as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 10: Robustness tests II

	Sales target	Change in risk attitude	Average FE	Negative FE (absolute value)	Positive FE (absolute value)
	(1)	(2)	(3)	(4)	(5)
Current situation					
Competition	0.076***	0.099***	0.081***	0.046	0.002
	(0.025)	(0.026)	(0.026)	(0.058)	(0.063)
Financing	0.166***	0.214***	0.190***	0.249***	0.100**
	(0.024)	(0.024)	(0.025)	(0.051)	(0.051)
Cost of material	-0.104***	-0.112***	-0.107***	-0.112**	-0.146***
	(0.024)	(0.024)	(0.024)	(0.051)	(0.055)
German economy	0.198***	0.226***	0.198***	0.196***	0.233***
	(0.025)	(0.025)	(0.025)	(0.051)	(0.054)
Expected change					
Competition	0.090***	0.084***	0.091***	0.054	0.099
	(0.032)	(0.032)	(0.032)	(0.065)	(0.062)
Financing	0.128***	0.121***	0.126***	0.002	0.295***
	(0.032)	(0.033)	(0.033)	(0.068)	(0.066)
Cost of material	-0.052**	-0.045*	-0.053**	-0.023	-0.031
	(0.025)	(0.025)	(0.025)	(0.055)	(0.053)
German economy	0.053*	0.036	0.053*	0.034	-0.016
	(0.028)	(0.028)	(0.028)	(0.058)	(0.059)
Firm controls					
Revenue	0.027	-0.039**	-0.058***	-0.098***	-0.060*
	(0.021)	-0.039**	(0.016)	(0.031)	(0.031)
Risk and FE					
Risk attitude	0.183***	0.160***	0.186***	0.147***	0.216***
	(0.020)	(0.032)	(0.021)	(0.039)	(0.043)
Absolute FE	-0.079**	-0.084***	-0.088***	-0.413***	0.007
	(0.031)	(0.031)	(0.031)	(0.118)	(0.111)
Average FE			0.016		
			(0.047)		
Cutoff					
Cutoff1	0.992***	0.965***	0.777***	-0.185	0.678**
	(0.136)	(0.163)	(0.139)	(0.339)	(0.283)
Cutoff2	1.618***	1.588***	1.404***	0.489	1.368***
	(0.136)	(0.164)	(0.140)	(0.337)	(0.288)
Cutoff3	2.798***	2.754***	2.585***	1.605***	2.527***
	(0.142)	(0.171)	(0.145)	(0.341)	(0.296)
Cutoff4	3.404***	3.346***	3.192***	2.196***	3.140***
	(0.144)	(0.174)	(0.148)	(0.346)	(0.300)
Observations	3,687	3,637	3,636	820	701
Pseudo R-squared	0.07	0.06	0.07	0.06	0.07
Sector-fixed effects	-	-	-	-	-
Time-fixed effects	-	-	-	-	-

This table shows various robustness tests for the baseline model (equation 1). Dependent variable is the change in investment measured on an ordinal 5 categories scale. A (strong) reduction in investments corresponds to minus (-/--), zero stands for no change (0), and plus for a (strong) increase in investments (+/++). Independent variable is the absolute forecast error. We control for a set of variables (competition, financing, cost of material, German economy) regarding the current situation and the expected change, both are also measured on a 5 category scale, where the lowest outcome stands for a very bad situation/strong worsening and the highest outcome for a very good situation/strong improvement. Furthermore, we control for the revenue and the risk attitude. In column 1, the achievement of the sales target is included instead of the revenue. In column 2, we exchange the current risk attitude by the expected change in the risk attitude. In column 3, we additionally include the average forecast error by firm. Finally, we run regressions for all observations at which firms have a negative forecast error (column 4) or a positive forecast error (column 5) whereas in both cases we take the absolute value of the forecast error. No fixed effects are included. The time span reaches from 2007 until 2011 if not indicated otherwise. The standard errors are clustered by firm if not indicated otherwise and depicted in parentheses. The p-values are as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Halle Institute for
Economic Research (IWH)

IWH Risk Climate Index

Halle Institute for Economic Research (IWH) -
Member of the Leibniz Association
Kleine Maerkerstraße 8
D-06108 Halle (Saale), Germany

Survey code: XXXX

New address:

Your answers will be treated confidentially. Statutory data protection is fully assured. No transfer of the data to a third party.

Short answer (Please fill in only if answering the questionnaire is not possible.):

☐ I'm the wrong contact person.
Please contact:

Name: ______________________ Phone: ______________

Position in the company: ______________________

☐ The participation in this survey is not possible for our company,

because ________________________________.

Survey Spring 2011

1. How do you evaluate the current situation based on the following categories from the perspective of your company? What do you expect with respect to the future development in the following six months?

	a) The current situation from the perspective of your company						b) The development in the following six months					
	very bad				very good	no response	Deteriora-tion		no change		Improve-ment	no response
	--	-	0	+	++		--	-	0	+	++	
1.1 Overall situation of the company	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1.1.1 Production/ Goods and services	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1.1.2 Revenue	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1.1.3 Competitive environment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1.1.4 Financing of investment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1.1.5 Costs of inputs and raw materials	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1.1.6 Labor supply	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1.1.7 General conditions of economic policy	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1.2 Overall economic situation in Germany	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

2. How do you evaluate the stability of the expected development based on the following categories? Which are the resulting implications for your company?

	a) The stability of the development in the following six months						b) The resulting implications for your company					
	very instable				very stable	no response	negative implications		no implications		positive implications	no response
	--	-	0	+	++		--	-	0	+	++	
2.1 Overall situation of the company	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2.1.1 Production/ Goods and services	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2.1.2 Revenue	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2.1.3 Competitive environment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2.1.4 Financing of investment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2.1.5 Costs of inputs and raw materials	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2.1.6 Labor supply	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2.1.7 General conditions of economic policy	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2.2 Overall economic situation in Germany	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

3. How do you evaluate the willingness to take risks of your company?

	very low				very high	no response
Current willingness to take risks	☐	☐	☐	☐	☐	☐

4. Which change in the willingness to take risks of your company do you expect in the following six months?

	increase		no change		decrease	no response
Change in the willingness to take risks in the following six months	☐	☐	☐	☐	☐	☐

5. Has the sales target of your company for the last business year been achieved?

	better than targeted		achieved		worse than targeted	no response
Achievment of sales target	☐	☐	☐	☐	☐	☐

6. Which changes in the investment volume do you expect for the current business year compared to the last business year?

	decrease		no change		increase	no response
Change of investment volume for the current business year	☐	☐	☐	☐	☐	☐

General information concerning your company

7. On which area of the sector ´Repair and installation of machinery and equipment` does the focus of your company lie?

☐ Repair of fabricated metal products, machinery and equipment

☐ Installation of industrial machinery and equipment

☐ A different area of the sector named above

☐ Our focus is not in the sector above, but: ______________________________

8. What is your most important product? ______________________________

9. How many employees (without apprentices) work in your company?

☐ 1 - 4 ☐ 5 - 24 ☐ 25 - 49 ☐ 50 - 74 ☐ 75 and more

10. How large was your approximate revenue in the last business year?

☐ < 250 T€ ☐ 250 - 499 T€ ☐ 500 - 999 T€ ☐ 1 - 5 Mio. € ☐ > 5 Mio. €

11. How large was the fraction of the revenue from foreign sales?

☐ < 1 % ☐ 1 - 10 % ☐ 11 - 20 % ☐ 21 - 40 % ☐ > 40 %

Contact person in your company

Name: ______________________ Position in your company: ______________________

Phone: ________________ Fax: ________________ Email: ______________________

The evaluation of the results should be sent by: ☐ Mail ☐ Fax ☐ Email ☐ not at all

Thank you very much for your cooperation.

Please provide suggestions and further comments here.

Please send us back the questionnaire until Friday **04/08/2011**

Halle Institute for Economic Research –
Member of the Leibniz Association

Kleine Maerkerstrasse 8
D-06108 Halle (Saale), Germany

Postal Adress: P.O. Box 11 03 61
D-06017 Halle (Saale), Germany

Tel +49 345 7753 60
Fax +49 345 7753 820

www.iwh-halle.de

ISSN 2194-2188

Member of the
Leibniz Association