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Abstract

Using new survey data on quantitative growth expectations of firms in Germany, we show that firms resort to local information when forming expectations about aggregate growth. Firms extrapolate from the economic situation in their county, industry growth and their individual business situation. The effect is particularly strong for small firms and explains part of the high expectation dispersion across firms. Furthermore, we show that growth expectations are correlated with employment and investment decisions of firms, highlighting that differences in expectations do indeed seem to lead to differences in actual firm decisions. Our results confirm predictions of theoretical models with rational inattention.

JEL-Codes: D840, E200, E320.

Keywords: GDP expectations, expectation heterogeneity, disagreement, rational inattention, ifo business tendency survey.

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1 Introduction

Expectations play a central role in current macroeconomic models and it is widely believed that they are a key driver of aggregate fluctuations (Beaudry and Portier, 2007; Angeletos and La'O, 2013). Yet, it remains controversial how macroeconomic expectations are formed and how macroeconomists should model this process. In particular, evidence on how firms form macroeconomic expectations remains very scarce. As firms are of central importance for price setting as well as labor and investment demand, a better understanding of what determines their expectations is of crucial importance for macroeconomic research and policy. Recently, Andrade et al. (2022) provide empirical evidence that—in line with the "island" model proposed by Lucas (1972)—industry conditions affect firms' views of macroeconomic conditions. In this paper, we provide more evidence that local business conditions do indeed play a role when firms form expectations about aggregate economic variables in a way that is consistent with the predictions of a model with rational inattention as in Maćkowiak and Wiederholt (2009).

In particular, we show that firms' expectations of the growth rate of the (real) gross domestic product (GDP), henceforth "growth expectations", are driven by economic conditions in the firms' headquarters county and in their industry as well as by the idiosyncratic business situation of firms. This means that the local signals that firms use to form their macroeconomic expectations are not limited to industry-specific information. On balance and consistent with models of rational inattention, these effects are larger for small firms that presumably do not have the capacity to allocate attention to aggregate conditions and thus away from idiosyncratic conditions (Maćkowiak and Wiederholt, 2009). We also show that those small firms—in contrast to large firms—do not act upon their growth expectations when it comes to employment and investment decisions, again supporting the idea of firms being inattentive, yet rational.

We obtain this evidence by augmenting the ifo Business Tendency Survey (BTS), a large-scale, high-level, and fairly representative business survey in Germany,[1] with a ques-

[1] Sauer and Wohlrabe (2019) document that the BTS is usually answered by senior managers. As a consequence of the long-standing nature of the survey, young firms and start-ups are underrepresented.

tion that elicits growth expectations of firms in several survey waves during the period from 2018 to 2020. We can link these expectations about aggregate growth to i) other firm-level information from the survey (such as business expectations, business decisions, and firm size), ii) local unemployment (which we use as a proxy for regional economic conditions), and iii) industry-specific information. This allows us to estimate the nexus between local information and macroeconomic expectations using panel regressions that feature a wide range of fixed effects to control for unobserved confounders. To mitigate potential endogeneity problems, we use carefully selected subsamples of firms whose local variables are unlikely to be driven by their growth expectations (e.g., because their business expectations were noncyclical in the past). The large (roughly $4,800$ firms) and fairly representative sample of firms in Germany makes it ideal for studying heterogeneity in expectation formation across different types of firms.

We study growth expectations—thereby complementing other studies that focus on inflation expectations of firms—because aggregate demand is a key variable for fluctuations in corporate investment demand (Bachmann and Zorn, 2020). Since GDP is the broadest measure of aggregate demand available, firms' expectations of GDP growth are an important driver of their business decisions (Tanaka et al., 2020).[2]

We first document that the heterogeneity of growth expectations across firms is large, indeed more similar to that observed for private households than for professional macroeconomic forecasters. This is in line with evidence in Coibion et al. (2018); Tanaka et al. (2020) and Candia et al. (2021, 2022). In all economic sectors that we investigate (manufacturing, trade, and services), the dispersion of growth expectations is higher for small firms than for large firms. Heterogeneity is also higher for firms whose business does not depend on the general business cycle in Germany. These findings support theories of rational inattention that imply that firms pay less attention to economic information if the fixed cost of doing so are large relative to the size of the firm and/or the benefits of closely monitoring the business cycle are low.

[2]Even if sector-specific demand is eventually what firms are interested in, the demand for specific products is likely to depend strongly on aggregate demand in most industries.

We then turn to the question of whether information that firms gather in their local environment ("island") shape their expectations for aggregate growth and, thus, partially explain the heterogeneity of macroeconomic expectations. We find that firms which are located in a county that is not doing well economically (as indicated by high local unemployment) tend to have more pessimistic growth expectations. A 1 percentage point increase of the unemployment rate in the home county of a firm is associated, on average, with roughly 31 basis points lower growth expectations of this firm. We observe a similar—albeit very small—effect from industry-specific economic conditions on firms' aggregate growth expectations. Finally, we find that firms which report a positive current business situation, positive expectations for their own business or expectations of rising product prices report more optimistic growth expectations. Overall, these effects are driven by small firms in our sample while growth expectations of larger firms are more independent of local information.

The evidence that firms extrapolate from their own economic experiences to the broader national business cycle situation is in line with "island models" (Lucas, 1972) that have recently been picked up by the modern macroeconomic literature on models with rational expectations and information frictions (e.g. Lorenzoni, 2009; Angeletos and La'O, 2013; Nimark, 2014). The fact that small firms pay more attention to local information when forming expectations of aggregate variables is consistent with models of rational inattention which postulate that firms need to optimally allocate a limited amount of attention. It is plausible that small firms have less attention at disposal overall (Maćkowiak and Wiederholt, 2009). Our evidence complements several studies that show in other contexts how "local" information significantly affects macroeconomic expectations and is an important driver of expectation heterogeneity (Berger et al., 2009, 2011; Kuchler and Zafar, 2019; Andrade et al., 2022).

Finally, we document that growth expectations are positively related to firms' investment and labor demand. Even after controlling for reported business situation and expectations (and a number of fixed effects) higher growth expectations are associated with a higher propensity of firms to increase investment spending and the number of employees.

This complements evidence in Coibion et al. (2020) who show that inflation expectations of firms affect business decisions. Looking at heterogeneity across the size distribution of firms, we find that the effect is driven by large firms while small firms do not resort to their growth expectations when making employment and investment decisions. This suggest that small firms are aware that their growth expectations are extrapolated from local information and do not act upon them. Or in other words: small firms are more likely (relative to large firms) to rationally choose not to invest into acquiring information beyond what they notice "on their islands" when forming expectations of aggregates and, at the same time, are wise enough to not rely too much on those macroeconomic expectations when making business decisions.

From a broader perspective, our paper contributes to a booming literature that studies how market participants—most importantly private households and firms—form macroeconomic expectations (Manski, 2018). Contributions by, inter alia, Manski (2004), Mankiw and Reis (2002), Sims (2003), Woodford (2003), and Coibion and Gorodnichenko (2015) have spurred a rapidly growing theoretical and empirical literature that aims to measure and model macroeconomic expectations more realistically and more coherently with properties of observed macroeconomic expectations than the FIRE model.

The empirical evidence on how firms form expectations yet remains scarce as many surveys collect only qualitative data or are limited to specific subsets of firms based on a firm's sector or size (Andrade et al., 2022; Tanaka et al., 2020).[3] Kumar et al. (2015) and Coibion et al. (2018) analyze a more representative sample of firms in New Zealand. Candia et al. (2021) use a monthly panel of survey-based inflation expectations of US firms to show that the size and in particular the industry of a firm affects expectations. Link et al. (2021) combine data from the BTS with a survey among private households to compare firm expectations with those of households. With the exception of Tanaka et al. (2020), these papers primarily focus inflation expectations. Candia et al. (2022) provide an overview of the literature on inflation expectations of firms.

[3]The literature on household expectations is more comprehensive. Still, only few data sets contain information on quantitative expectations of private households. Exceptions include Bruine De Bruin et al. (2011), Das et al. (2020), Malmendier and Nagel (2011), and Malmendier and Nagel (2016).

The remainder of this paper is structured as follows. Section 2 describes the data that we use, in particular the novel data on quantitative corporate growth expectations. Section 3 presents evidence on the expectation formation process of firms, which includes details on the dispersion of expectations (Section 3.1), results on the impact of local conditions on expectations (Section 3.2), and a review of the consistency of our findings with theoretical macroeconomic models (Section 3.3). Section 4 analyzes the effect of growth expectations on firms' employment and investment decisions. Section 5 concludes.

2 Data and Descriptive Statistics

Most of our data come from the ifo Business Tendency Survey (BTS) conducted monthly by the ifo Institute. The survey covers various business aspects for a panel of firms.[4] We use data on firms from the manufacturing sector, the trade sector, and the service sector. For about 98 % of firms, one particular person is responsible for regularly answering the questionnaire (Sauer and Wohlrabe, 2019). More than 80 % of those persons are in an upper management position such as owner, CEO, or department head. This suggests that respondents have a good overview of their company and provide answers that accurately reflect sentiments representative of the firm.

We elicit quantitative growth expectations in the survey waves conducted in August 2018, March and August 2019 and August 2020. We asked firms to report their expected annual growth rate of real GDP for the current and next year with one decimal.[5] This results in expectations data for four target years collected at four time points. On average, about 80 % of firms that returned a questionnaire answered our question, leaving us with about $4,500$ to $5,000$ observations per survey wave.[6]

[4]The BTS is technically conducted at the product level, i. e., some larger firms answer more than one questionnaire. We aggregate the answers to the firm level by using the mean over all questionnaires returned by one firm as proposed by Link (2020). For qualitative questions we transform the mean of all questionnaires returned by one firm back into discrete answer categories.

[5]See Appendix B for the exact wording of the special questions. In the wave of August 2018, we asked about growth expectations for the current calender year only.

[6]We drop all observations that lie outside a three-standard-deviations interval around the median growth expectation for each combination of survey wave and target year to exclude unreasonably high or low expectations. Overall, we lose about 1 % of the observations.

Table 1: Descriptive Statistics for Quantitative Growth Expectations

Survey	Aug '18	Mar '19		Aug '19		Aug '20	
Expectation	2018	2019	2020	2019	2020	2020	2021
N	4,641	4,831	4,774	4,856	4,831	5,010	4,961
Mean	1.8	1.2	1.1	0.9	0.8	−6.2	1.5
Median	1.8	1.2	1.0	1.0	1.0	−7.5	2.0
Std. Dev	1.3	1.4	1.5	1.6	1.7	7.9	6.2

Notes: All numbers refer to the entire sample after dropping any observations that exceed the median by three standard deviations in each wave. In total, we drop about 1 % of all answers.

In the first three survey waves, average growth expectations range from 0.8 % to 1.8 % which is slightly higher than the actual GDP growth rates in those years (Table 1). In the survey from August 2020 average expectations for the same year drop sharply in response to the COVID-19 pandemic. A similar disruption is visible when considering the dispersion of expectations. Standard deviations increase slightly from 1.3 % to 1.7 % between the surveys in 2018 and 2019, followed by a stark rise beyond 6 % in August 2020. We do not observe strong differences in average growth expectations across sectors (Table A.1 in Appendix A).

We link three different types of local information to growth expectations of firms and further use these information to compute historical correlations of local economic conditions with the German business cycle to construct subsamples of "acyclical" firms.

First, we use local unemployment rates to approximate local business cycle conditions. These data are provided by the German Federal Employment Agency (Bundesagentur für Arbeit, BA). The monthly observations for 401 counties cover the period from 1991 to August 2020. To eliminate the effect of any seasonal movements in unemployment which tend to differ substantially across counties, we consider twelve-months moving averages of unemployment rates. Second, we measure industry conditions by the (quarterly) growth rates of sales or production in 379 industries. The data are from the German Federal Statistical Office (Statistisches Bundesamt). Finally, we use three measures from the regular BTS to measure firm-specific idiosyncratic business assessment, firms' business expectations, and firms' expectations of their own product prices (all reported on a trichotomous scale from -1 (bad/decreasing) to 1 (good/increasing)).

To analyze heterogeneity across the size distribution of firms, we construct a measure of firm size based on information from the BTS. Unfortunately, the survey does not provide a harmonized variable for firm size because the questionnaires differ across sectors. Therefore, we create a categorical measure of firm size with values ranging from 1 (very small) to 5 (very large). In the manufacturing and trade sector the measure is based on the number of employees, in the service sector it is based on turnover.

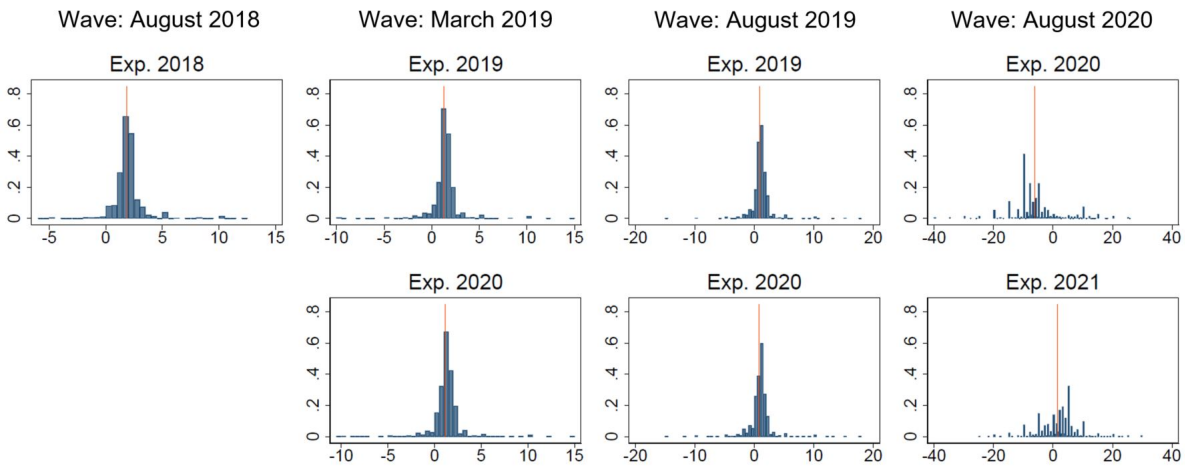
Finally, we use self-reported and qualitative assessments of planned and realized changes in employment and investment from the BTS to identify potential effects of growth expectations on business decisions. Again, these variables are reported on a trichotomous scale from -1 (decrease) to 1 (increase). The forward-looking measures refer to planned changes in the number of employees over the next two to three months and planned changes in investment expenditure in the current calendar year (relative to the previous year), respectively. The backward looking measures refer to employment changes over the past two or three months (depending on the sector) and the change in investment volume in the last calender year, respectively. In terms of timing, we match each expectation wave with the earliest available observation of the forward-looking measures (employment plans are covered by the survey every month, investment plans only in May and November). In the case of backward looking measures, we match each expectation wave with the assessment of employment from two or three months later (depending on the sector) and with the assessment of investment from the next calendar year, respectively.

In addition, we control for the historical volatility of business expectations, a firm's success in predicting their own business situation in the past and whether a firm answered the questionnaire online or on paper.[7]

To construct subsamples of firms that are relatively independent of the German business cycle we use five different approaches. First, we select firms based on the historical correlation of their business assessment with GDP growth over the period from 1990 to 2020. Second, we select those firms that make a large share of their turnover on export

[7]We measure historical volatility by the standard deviation of the monthly responses between 1991 and 2018. We compute a firm's success in predicting its own business situation by the firm-specific expectation error as in Bachmann and Elstner (2015).

Figure 1: Dispersion of Growth Expectations for Different Waves and Target Years.



Notes: This figure shows histograms of firm's GDP expectations for the years 2018 to 2021 elicited in four different survey waves. The red lines indicate the mean expectations.

markets. We do this based on self-reported export shares elicited using a special survey question in September 2018. Third, we use answers to a special question in August 2018, which asked firms to indicate on a five-point scale how dependent their business model is on the German business cycle ("GDP importance"). The fourth sub-sample includes firms in counties where the correlation between local unemployment and German GDP growth historically has been low. Lastly, we select companies in industries with low correlation between industry growth and general economic growth. Table A.2 in Appendix A contains a set of descriptive statistics for all variables.

3 Heterogeneity of Corporate Growth Expectations

3.1 Expectation Dispersion and Firm Size

It is a well known fact that macroeconomic expectations are dispersed if compared across individuals (e.g., Mankiw et al., 2003; Dovern et al., 2012). Similar to previous findings by, inter alia, Coibion et al. (2018) and Tanaka et al. (2020) we find that the dispersion of firms' growth expectations is large.

The histograms in Figure 1 show a very broad distribution for each survey wave and target year, especially during the COVID-19 pandemic in 2020. The cross-sectional

Table 2: Dispersion of Growth Expectations in Different Surveys

Panel A: ifo BTS and Professional Forecasters

	ifo BTS		Consensus Econ.		SPF (ECB)		SPF (Fed)	
Target	Survey	Std. Dev.	Survey	Std. Dev.	Survey	Std. Dev.	Survey	Std. Dev.
Same Year	Aug. 18	1.3	Aug. 18	0.1	Oct. 18	0.1	Aug. 18	0.1
Same Year	Mar. 19	1.4	Mar. 19	0.3	Apr. 19	0.2	Feb. 19	0.2
Next Year	Mar. 19	1.5	Mar. 19	0.3	Apr. 19	0.3	Feb. 19	0.5
Same Year	Aug. 19	1.6	Aug. 19	0.2	Oct. 19	0.1	Aug. 19	0.1
Next Year	Aug. 19	1.7	Aug. 19	0.4	Oct. 19	0.2	Aug. 19	0.5
Same Year	Aug. 20	7.9	Aug. 20	0.7	Oct. 20	0.6	Aug. 20	0.8
Next Year	Aug. 20	6.2	Aug. 20	1.2	Oct. 20	0.8	Aug. 20	2.5

Panel B: ifo BTS and Other firm surveys

	ASBC Japan		Firm Survey NZ	
Target	Survey	SD	Survey	SD
4q ahead	Various	1.3*	Various	0.5–1.0†

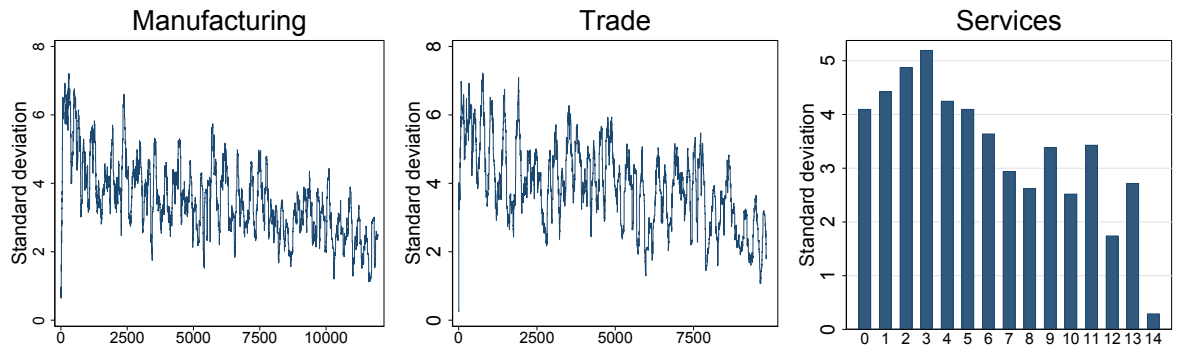
Notes: Measures from the ifo BTS refer to the trimmed sample. * Tanaka et al. (2020) report the average standard deviation across all survey waves from 1989 to 2015. † The survey was conducted four times and the standard deviations of growth expectations where 0.7, 1.0, 0.5, and 0.6 percentage points, respectively.

standard deviation of growth expectations of German firms is much higher than those of professional forecasters (Panel A in Table 2). This is in line with findings for inflation expectations of firms (Andrade et al., 2022; Candia et al., 2022). The cross-sectional standard deviation in our sample (before the pandemic) is very similar to that observed for growth expectations of firms in Japan and New Zealand (Tanaka et al., 2020; Coibion and Gorodnichenko, 2015) (Panel B of Table 2).[8] Overall, the large disagreement indicates that growth expectations are formed based on different and potentially noisy signals about the state of the economy that firms are exposed to. We analyze the role of local information in that context in Section 3.2.

Figure 2 shows, for each sector, how the cross-sectional standard deviation of growth expectations varies with firm size. There is a clear downward trend in dispersion with increasing firm size. We observe the same trend when using the categorical measure that we use to measure firm size homogeneously across the three sectors (Appendix A,

[8]Due to the lack of surveys that contain information about quantitative growth expectations of households a comparison to corresponding results for private households is not possible. Link et al. (2021) document lower levels of dispersion among firms than among households for expectations of inflation, unemployment, and the policy rate.

Figure 2: Standard Deviation of Growth Expectations and Firm Sizes



Notes: The graph shows the standard deviation of firms' GDP growth expectations according to their size from small to large. For the manufacturing sector and the trade sector, we measure firm size by the number of employees and calculate the standard deviation over rolling windows of 100 firms after ordering the firms by firm size. In the service sector we calculate standard deviations for each turnover category available in the BTS.

Figure A.1). The differences in standard deviations across the five size categories are significantly different from zero (Appendix A, Table A.3).[9]

Overall, we find that growth expectations of firms are much more dispersed than those of professional forecasters and that the level of dispersion varies across the size distribution of firms. We now turn to the question of whether differences in local information partly explain the heterogeneity of expectations.

3.2 Local Conditions and Growth Expectations

To empirically analyze the link between local information and expectations of aggregate growth, we resort to local unemployment (as a proxy for the local business situation), industry growth (as a proxy for the economic situation of individual industries), business assessment and expectations of future product prices (as proxies for idiosyncratic information and shocks they face). Our focus is the analysis of the cross-sectional variation. We remove common time effects on expectations by adding fixed effects for each survey wave and target year in all specifications ("Wave FE"). Since quantitative aggregate growth

[9]The pattern is less pronounced when we split the sample according to the self-reported measure for the importance of the business cycle (Panel B of Figure A.1 and Table A.4 in Appendix A).

expectations were collected in only four waves of the BTS, we cannot analyze how growth expectations adjust dynamically to local shocks like Andrade et al. (2022) do.

For all analyses in this section, the dependent variable is growth expectations of firms. We add regional and industry fixed effects to capture variation in growth expectations driven by unobserved local or industry conditions.[10] In additional regressions, we add control variables measuring firm-specific characteristics (firm size, historical volatility of business expectations, success in predicting the own business situation, answering online or on paper). Finally, we estimate models with firm fixed effects to capture any firm-specific unobservables. In these regressions, the link between local information and growth expectations is identified based on within-firm variation.

To address potential heterogeneity in the strength of extrapolation from local conditions across the firm-size distribution, we also consider specifications with interaction terms. The interaction terms refer to the categorical measure of firm size, which is consistent across sectors.

To minimize the risk to find correlations between growth expectations and local conditions only because the latter might be driven by the former (a mechanism that would be diametrically opposed to the one suggested by "island" models), we look at subsamples of firms for which this is unlikely. We follow Andrade et al. (2022) and select firms from regions or industries that historically have been very acyclic. In the case of the idiosyncratic business situation, we base the subsamples on various measures of a firm's dependence on the German business cycle.

The descriptive results above suggest that the COVID-19 pandemic had strong effects on expectation disagreement among firms. It is very likely that the expectation formation process was heavily influenced by the pandemic in 2020 and quite different from normal times. For this reason, we estimate some specifications using samples that exclude data collected in 2020.

[10]The firms in our sample cover all of the 401 administrative districts, called "Kreise und kreisfreie Städte". The 379 industries are defined by the German standard classification system of 2008 (*WZ 08*).

3.2.1 Local Economic Environment

The first local measure is the economic situation firms experience in the area where they do business. The idea is that firms generalize from the conditions in their county to the business cycle situation of the entire country since they confound local and aggregate shocks. Given that each individual county is too small to have a substantial impact on the overall growth rate in Germany, such behavior would constitute a deviation from optimal forecasting (under full information) and could explain some of the variation of expectations across firms.

We use the local unemployment rate to measure the strength of the local economy because it is one of the few economic indicators that is available without major publication lag—and, hence, observable for the firms in near real time.[11] To measure the relative economic strength of a county, we simply take the average of the unemployment rate during the 12 months ending with the respective survey wave.

Table 3 displays the results. Columns 1-4 show the results when gradually including more fixed effects and controls. Beginning with column 2 where we include control variables, region and industry fixed effects in addition to wave fixed effects, the coefficient has the expected sign and is statistically significant at the 5 % level. A one percentage point increase in the unemployment rate (in a county) is associated with growth expectations (for Germany) of local firms that are 0.3 percentage points lower. This effect is conditional on the current economic situation in Germany for which we control with wave-target year fixed effects. We find equivalent results when using firm fixed effects (column 3). Firms that experience an increase in local unemployment adjust expectations about aggregate growth downward.

Column 4 shows the estimates for different firm sizes. The baseline corresponds to the smallest firm size category; the interaction terms quantify the additional effects for firms in the other four size categories in ascending order. Summing up the baseline and the respective interaction coefficient yields the total effects for these larger companies.

[11] We use information about the firms' ZIP codes and the municipality names in their address to assign them to counties. We loose approximately 11 % of answers because either no information about the location is provided or because – due to reporting errors – the reported combination of ZIP code and municipality name does not allow identifying an unambiguous county.

The baseline coefficient is highly significant and suggests a stronger effect for small firms compared to the overall effect in the previous column. The interaction coefficients increase with firm size, suggesting a fading impact of unemployment on expectations for larger firms. In fact, large firms (size category four and five) do not extrapolate from local conditions. The total effect for those firms is not statistically different from zero. In the pre-pandemic sample, only the baseline coefficient stays significant (column 5).

Focusing on firms in acyclical counties in column 6, the baseline coefficient is significant and higher compared to the full sample (column 4). This implies that local conditions inform growth expectations of small firms more in acyclical counties. Again, the total effects for larger firms are not significantly different from zero. We do not find significant results when excluding the survey wave from 2020 in the last column.

To quantify the amount of dispersion in expectations attributed to the local economic environment, we compare the explained share of variation (R^2) of a model with merely wave-target year fixed effects to that of a model with controls for the local economic environment. The comparison is based on data collected before 2020 to exclude effects of the greatly increased variance due to the COVID-19 pandemic. Local unemployment raises the explained share of variation in expectations by 0.5 %. When including county fixed effects instead of local unemployment, we observe an increase of 72.3 %.

3.2.2 Industry Environment

Firms might also confuse industry conditions with the state of the aggregate economy. Andrade et al. (2022) show empirically that expectations of French manufacturing firms about prices and production react fast to industry-specific shocks even if these shocks do not affect aggregate conditions.

We match annualized quarterly log growth rates in 379 industries to the survey data and perform regressions similar to the regional case with industry growth as the main explanatory variable.[12]

[12] We retrieve quarterly industry-specific data from the German Federal Statistical Office. Growth rates for industries in the trade sector are based on sales, growth rates for industries in the manufacturing and service sector are based on production.

Table 3: Impact of Local Unemployment on Growth Expectations

	All counties					Acyclical counties	
					w/o 2020		w/o 2020
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
U	0.025**	-0.304**	-0.310**	-0.421***	-0.228**	-0.717**	-0.138
	(0.011)	(0.134)	(0.133)	(0.157)	(0.102)	(0.365)	(0.205)
U × Firm size 2				0.025	-0.010	0.352	-0.035
				(0.108)	(0.050)	(0.319)	(0.139)
U × Firm size 3				0.122	-0.099	1.139***	-0.052
				(0.148)	(0.070)	(0.412)	(0.205)
U × Firm size 4				0.274*	-0.107	0.956**	-0.242
				(0.162)	(0.078)	(0.431)	(0.224)
U × Firm size 5				0.594***	-0.078	1.167**	-0.287
				(0.180)	(0.086)	(0.499)	(0.240)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	Yes	No	No	No	No	No
Industry FE	No	Yes	No	No	No	No	No
Firm FE	No	No	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	No	No	No	No
N	29,366	28,339	29,366	29,366	21,231	5,874	4,255
R^2	0.30	0.34	0.37	0.37	0.09	0.33	0.09

Notes: Columns 6-7 display estimates for subsamples of firms in counties with low historic correlation between local unemployment and German GDP growth. *p<0.1, **p<0.05, ***p<0.01. Standard errors clustered at county level in parentheses.

The coefficient on industry growth in columns 1-3 of Table 4 is highly significant and stable across all three specifications. Economically however, the effect is small: a 1 % increase in industry growth is related to an upward adjustment of expectations by 0.004 percentage points.

Mainly small firms are behind the effect as the baseline coefficient in column 4 shows. The interaction terms do not indicate a clear pattern and are mostly insignificant. Only firms in size category 4 do not seem to extrapolate from industry conditions. For those firms, the total effect is not statistically different from zero. We do observe a more distinct difference between small and larger firms in the sample of firms in acyclical industries (column 6). While small firms extrapolate from industry conditions (the baseline coefficient is now 0.02), larger firms in size category 2, 4 and 5 do not. Firms in size category 3 seem to step out of line with a positive (though insignificant) interaction coefficient.

In sum, also industry conditions explain some of the variation in growth expectations. In the pre-COVID-19 sample, industry growth increases the R^2 by about 0.3 % compared to a model with only wave-target year fixed effects. Including industry fixed effects leads to an increase by 69.4 %.

Table 4: Impact of Industry Growth on Growth Expectations

	All industries					Acyclical industries	
					w/o 2020		w/o 2020
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Industry growth	0.0039***	0.0037***	0.0037***	0.0036***	0.0056**	0.0192**	0.0016
	(0.0004)	(0.0005)	(0.0005)	(0.0012)	(0.0025)	(0.0080)	(0.0039)
IG × Firm size 2				0.0001	-0.0011	-0.0129	0.0046
				(0.0013)	(0.0031)	(0.0091)	(0.0045)
IG × Firm size 3				0.0022	0.0042	0.0072	0.0029
				(0.0016)	(0.0043)	(0.0134)	(0.0073)
IG × Firm size 4				-0.0043**	-0.0016	-0.0398**	0.0011
				(0.0019)	(0.0055)	(0.0180)	(0.0094)
IG × Firm size 5				0.0002	-0.0015	-0.0204	0.0022
				(0.0018)	(0.0044)	(0.0134)	(0.0070)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	Yes	No	No	No	No	No
Industry FE	No	Yes	No	No	No	No	No
Firm FE	No	No	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	No	No	No	No
N	32,067	27,243	32,067	32,067	22,650	7,146	5,014
R^2	0.30	0.34	0.39	0.39	0.09	0.37	0.08

Notes: Columns 6-7 display estimates for subsamples of firms in industries uncorrelated with German GDP growth. *p<0.1, **p<0.05, ***p<0.01. Standard errors clustered at county level in parentheses.

3.2.3 Idiosyncratic Business Situation

Finally, firms might see "private information" about their own business situation as a signal about aggregate growth. They could (unconsciously) assume that a positive outlook for their own business translates to the aggregate economy. Similarly, a firm might interpret expectations about the future development of own sales prices not only as a signal about the demand for its own products but as informative for aggregated demand in the whole economy. To explore this link, we relate the quantitative growth expectations of firms to their reported business expectations and expectations about future product prices.

We face a problem of potential reverse causality at this point because a firm might well report pessimistic business expectations *because* it is pessimistic about future GDP growth. We address this concern in two ways while acknowledging that a proper identification of causal effects is hard given the data that we have at our disposal.

First, we argue that the issue is less problematic when looking at the relation between the assessment of the *current business situation* and growth expectations since the current situation of a firm depends on actual current factors rather than the expectation that a

Table 5: Impact of Business Assessment on Growth Expectations

	Full sample		Importance ≥ 4		Foreign Sales >75		GDP corr. ($q_{0.1}$)		Industr. corr. ($q_{0.2}$)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bus. ass.	0.29***	0.35***	0.51***	1.00**	0.50**	3.30***	0.52**	1.98***	0.54***	0.55**
	(0.05)	(0.11)	(0.19)	(0.39)	(0.24)	(1.02)	(0.21)	(0.50)	(0.12)	(0.25)
Bus. ass. × Firm size 2		-0.13		-1.14**		-3.64***		-1.59***		-0.03
		(0.12)		(0.48)		(1.08)		(0.57)		(0.30)
Bus. ass. × Firm size 3		-0.03		0.14		-2.37**		-1.05		0.00
		(0.15)		(0.56)		(1.09)		(0.67)		(0.41)
Bus. ass. × Firm size 4		0.01		-0.32		-2.98**		-2.08**		0.21
		(0.18)		(0.78)		(1.18)		(0.84)		(0.47)
Bus. exp. × Firm size 5		-0.02		-0.59		-2.84**		-2.81***		-0.08
		(0.17)		(0.82)		(1.13)		(0.73)		(0.49)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No	No	No	No	No
N	33,766	33,766	1,960	1,960	1,033	1,033	2,067	2,067	7,163	7,163
R^2	0.38	0.38	0.38	0.38	0.40	0.41	0.37	0.38	0.38	0.38

Notes: Columns 3-10 display estimates for subsamples consisting of firms whose business is independent of the German business cycle. We focus on firms that report that the German business cycle is unimportant for their business (columns 3-4), firms that make more than 75 % of their sales abroad (columns 5-6), firms with low historic correlation between their business assessment and German GDP growth in the past (columns 7-8), and firms in industries uncorrelated with German GDP growth (columns 9-10). *p<0.1, **p<0.05, ***p<0.01. Standard errors clustered at county level in parentheses.

firm has for the general economic outlook. Hence, we will regress growth expectations on the reported business assessment.

Second, we use subsamples of firms for which the German business cycle is not very important, i.e., firms that face demand that is not strongly correlated with the German business cycle. For those firms their expectation of domestic GDP growth should not affect their business outlook. A significant correlation would indicate that when forming growth expectations firms extrapolate from their business expectations. We select these subsamples in four ways. We rely on i) a self-reported measure of importance of the business cycle for the business of a firm, ii) information about export shares that firms reported in September 2018, iii) the historical correlation between German GDP growth and the business assessment of firms, and iv) firms in industries that are decoupled from aggregate growth as measured by the historical correlation between industry growth and aggregate growth. For each subsample, we estimate the overall effect as well as specifications that include interaction terms based on the firm size categories. All models include firm fixed effects.

Table 5 presents the results for our first strategy using business assessment as the main explanatory variable. The estimate in column 1 is highly significant and suggest

Table 6: Impact of Business Expectations on Growth Expectations

	Full sample		Importance ≥ 4		Foreign Sales >75		GDP corr. ($q_{0.1}$)		Industr. corr. ($q_{0.2}$)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bus. exp.	0.29***	0.45***	0.50***	0.91**	0.13	1.36	0.33*	2.19***	0.13	0.80***
	(0.05)	(0.10)	(0.18)	(0.36)	(0.23)	(0.85)	(0.19)	(0.46)	(0.11)	(0.23)
Bus. exp. × Firm size 2		-0.14		-0.89**		-1.70*		-2.27***		-0.87***
		(0.12)		(0.44)		(0.91)		(0.54)		(0.28)
Bus. exp. × Firm size 3		-0.38**		-0.20		-0.98		-1.96***		-1.27***
		(0.16)		(0.55)		(1.01)		(0.62)		(0.38)
Bus. exp. × Firm size 4		0.02		0.27		-0.87		-2.35***		-0.30
		(0.18)		(0.69)		(1.12)		(0.72)		(0.42)
Bus. exp. × Firm size 5		-0.35*		-0.48		-1.14		-2.38***		-0.89*
		(0.18)		(0.83)		(1.01)		(0.73)		(0.48)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No	No	No	No
Controls	No	No	No	No	No	No	No	No	No	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	33,725	33,725	1,958	1,958	1,029	1,029	2,071	2,071	7,142	7,142
R^2	0.38	0.38	0.38	0.39	0.39	0.40	0.38	0.38	0.38	0.38

Notes: Columns 3-10 display estimates for subsamples consisting of firms whose business is independent of the German business cycle, that is firms that report that the German business cycle is unimportant for their business (columns 3-4), firms that make more than 75 % of their sales abroad (columns 5-6), firms with low historic correlation between their business assessment and German GDP growth in the past (columns 7-8), firms in industries uncorrelated with German GDP growth (columns 9-10). *p<0.1, **p<0.05, ***p<0.01. Standard errors clustered at county level in parentheses.

that when firms see their business situation to be more favorable they tend to report 0.3 percentage points higher growth expectations. The size of a firm does not turn out to be relevant (column 4).

Columns 3-10 of Table 5 and Table 6 display the results for the second strategy. When we do not differentiate by firm size, the coefficient on business expectations is positive and significant in all subsamples when considering business assessment (Table 5). In the case of business expectations we find significant coefficients only in the low importance and low GDP correlation subsamples. Again, we observe large heterogeneity when we differentiate by firm size. The positive baseline coefficient in each subsample reveals that extrapolation from the business situation is clearly driven by small firms. Except for the foreign sales subsample in Table 6, the baseline coefficients are significant at least at the 5 % level with similar levels in both tables. In the case of business assessment they range from 0.55 for firms in acyclical industries (column 10) to 3.3 for firms with high levels of foreign sales (column 6). For larger firms this effect is either considerably weaker or non existent. Nearly all interaction coefficients have negative signs and yield an overall zero effect for the larger size categories.

Table 7: Impact of Price Expectations on Growth Expectations

	All firms				w/o 2020	Acyclical firms (low GDP corr. $q_{0.1}$)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Price exp.	0.21***	0.19***	0.22***	0.49***	0.05	-0.21	0.40
	(0.05)	(0.05)	(0.07)	(0.15)	(0.062)	(0.27)	(0.68)
Price exp. × Firm size 2				-0.37**	0.01		-0.55
				(0.18)	(0.07)		(0.78)
Price exp. × Firm size 3				-0.10	0.09		-0.34
				(0.22)	(0.09)		(0.95)
Price exp. × Firm size 4				-0.40	-0.12		-0.83
				(0.25)	(0.11)		(1.15)
Price exp. × Firm size 5				-0.38	0.15		-1.25
				(0.24)	(0.10)		(0.99)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	Yes	No	No	No	No	No
Industry FE	No	Yes	No	No	No	No	No
Firm FE	No	No	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	No	No	No	No
N	33,493	28,124	33,493	33,493	23,656	2,050	2,050
R^2	0.30	0.34	0.38	0.38	0.09	0.37	0.37

Notes: Columns 6-7 display estimates for a subsample of firms with low historic correlation between their business assessment and German GDP growth in the past. *p<0.1, **p<0.05, ***p<0.01. Standard errors clustered at county level in parentheses.

Lastly, we consider expectations about individual product prices as a proxy for local signals. For the full sample, we find a positive correlation between those price expectations and firms' growth expectations that is significant at the 1 % level (Table 7). A firm that expects its prices to go up in the next months, on average, reports 0.2 percentage points higher growth expectations (column 3). Regarding firm size heterogeneity, we observe a similar pattern as in previous examples: the effect is mainly driven by small firms. For larger firms the overall effect is not significantly different from zero (except for the case of firm size category 3). Furthermore, we do not find a significant correlation between product price expectations and growth expectations for the pre-COVID-19 sample and the subsample of firms whose business situation was uncorrelated with German GDP growth in the past—even though the signs of coefficients are unchanged in the latter case (column 7).

Overall, the results in this subsection indicate that firms seem to extrapolate systematically from their business situation when forming expectations about aggregate growth. Considering the sample elicited before 2020, the inclusion of business expectations or business assessment leads to an increase in R^2 by 34 % and 29 % compared to a model

with only wave-target year fixed effects. Considering both regressors jointly leads to an increases by as much as 48 %. In contrast, product price expectations do not explain much of the variation in growth expectations: including them increases the share of explained variation in growth expectations by only about 5 %.

3.3 Consistency with Theoretical Models of Expectation Formation

We now discuss to what extent the three empirical facts about growth expectations of firms that we have presented so far are consistent with the predictions of the main types of theoretical models with imperfect information structures that are discussed in the macroeconomic literature. We focus on the "island" model by Lucas (1972), the sticky information model with endogenous updating choice as in Reis (2006), the model of Maćkowiak and Wiederholt (2009) with limited attention capacity which builds on Sims (2003), and the model with "sentiment shocks" of Angeletos and La'O (2013). We summarize the consistency between models and empirical facts in Table 8.

The first empirical fact is that expectations are highly dispersed. All four models are able to replicate this fact because different agents—at each point in time—form their expectations about the future aggregate state of the economy based on different information sets.

The second empirical fact is that the dispersion of expectations is larger for small firms than for large firms. The models by Lucas (1972) and Angeletos and La'O (2013) cannot explain such heterogeneity across the firm size distribution because they imply exogenous mechanisms of information provision that are independent of the size of firms. Hence, the nature of information flows is independent of the size of a firm which rules out a systematic relationship between the degree of expectation dispersion and firm size. In contrast, information acquisition is endogenous in the other two models. In both cases, the model structure implies that it is optimal for large firms to acquire information about the state of the aggregate economy more frequently or to a greater extent relative to small firms—leading to less dispersed expectations among large firms. In the model by Reis (2006), firms need to pay a fixed cost to update their information set; the payoff

Table 8: Consistency of Theoretical Models and Empirical Results

	Dispersion	Size Dependence	Local Information
Lucas (1972)	✓	–	✓†
Reis (2006)	✓	✓	–
Maćkowiak and Wiederholt (2009)	✓	✓	✓§
Angeletos and La'O (2013)	✓	–	–*

Notes: † The model implies additional confusion between nominal and real shocks. § Extended version of the model where firms can choose to observe linear-combinations of aggregate and idiosyncratic signals. * Model features noisy idiosyncratic signals about local conditions in other parts of the economy instead of information about a firm's own local environment.

from being able to adjust prices optimally is larger for firms with large sales volumes. Therefore, large firms will update their information sets more frequently. In one of the model setups discussed in Maćkowiak and Wiederholt (2009, Section VII.B.), firms choose how much attention to pay to aggregate conditions, idiosyncratic information, and/or a linear combination of both. Maćkowiak and Wiederholt (2009) show that firms only pay substantial attention to aggregate conditions when the capacity for absorbing information is large. Presumably, this is the case only for large firms. In turn, small firms need to infer expectations about aggregates from the mixed signal that is influenced by idiosyncratic information—and, thus, have more dispersed expectations. In contrast, larger firms also pay attention to aggregate information that is the same for all firms—leading to smaller degree of expectation dispersion.

The third empirical fact is that "local" information influences expectations of firms about aggregate growth. As just described, this is a property of the model by Maćkowiak and Wiederholt (2009) when firms infer future aggregate conditions from a signal that is a linear combination of idiosyncratic and aggregate conditions. In contrast, it is clear that the model in Reis (2006) is not consistent with this fact. When firms update their information set in this model, they always obtain full information about the state of the world; dispersion in this model arises due to outdated information sets rather than any confusion of local and aggregate information. Things are more complicated in case of the two other models. In Lucas (1972), firms indeed have to infer the aggregate state of the

economy from local signals. More precisely, however, they observe local prices (a nominal variable) and have to infer aggregate demand (a real variable). So in addition to having to infer something aggregate from local information they face the problem of distinguishing monetary from real shocks. Most of our empirical setups focus on local *real* conditions and, hence, do not fully match this theoretical framework. We provide only tentative evidence in support of Lucas' model in form of the correlations between individual product price expectations and firms' growth expectations documented in the previous subsection. In Angeletos and La'O (2013)—a model that features "islands" as in Lucas (1972), with imperfect information flows between those "islands"—firms receive (noisy) signals about fundamentals and information sets of one trading partner ("one other island"). Hence, their expectations about future aggregates are driven by information about conditions in *other* parts of the economy. This is not in line with our understanding of local information, which implies that firms gain information about *their own* local environment.

In sum, while all four models are consistent with dispersed macroeconomic expectations of firms, only a version of the model framework with limited information processing capacities in Maćkowiak and Wiederholt (2009) can account for all three empirical facts that we describe above. The other theoretical models either fail to generate the negative relationship between expectation dispersion and firm size or do not provide a mechanism by which information about local/idiosyncratic conditions influence macroeconomic expectations. In all models, expectations determine decisions of firms. We analyze empirically whether growth expectations of firms correlate with subsequent business decisions in the next section.

4 Influence on Firm Behavior

Eventually, it is of interest whether heterogeneous expectations lead to differences in firm behavior. The BTS allows us to analyze the correlation between growth expectations and firm responses to questions about employment and investment that are regularly included in the survey.

Table 9: Employment and Growth Expectations

	Forward looking				Backward looking		
				w/o 2020			w/o 2020
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Growth exp.	0.000	0.000	-0.002**	-0.008**	0.002**	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.004)
Growth exp. × Firm size 2			0.001	0.022***		0.003**	0.008
			(0.001)	(0.005)		(0.001)	(0.005)
Growth exp. × Firm size 3			0.006***	0.007		0.007***	0.015**
			(0.002)	(0.007)		(0.002)	(0.007)
Growth exp. × Firm size 4			0.006***	0.026***		0.005**	0.013
			(0.002)	(0.008)		(0.002)	(0.009)
Growth exp. × Firm size 5			0.010***	0.042***		0.006***	0.034***
			(0.002)	(0.010)		(0.002)	(0.011)
Bus. exp.	0.199***	0.146***	0.147***	0.170***	0.049***	0.050***	0.046***
	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.007)
Bus. ass.	0.229***	0.197***	0.195***	0.142***	0.104***	0.103***	0.075***
	(0.004)	(0.005)	(0.005)	(0.007)	(0.005)	(0.005)	(0.007)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No
Firm FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No	No
N	33,222	33,222	33,222	23,437	28,320	28,320	20,266
R^2	0.22	0.14	0.14	0.10	0.04	0.04	0.03

Notes: *p<0.1, **p<0.05, ***p<0.01. Standard errors clustered at county level in parentheses.

We regress those measures of investment and employment changes on growth expectations —controlling for business expectations and assessment and the usual fixed effects and control variables (Tables 9 and 10). The first four columns in both tables show the results for the forward looking measures, the final three columns show the results for the backward looking measures.

The estimates of the coefficient corresponding to growth expectations are not significantly different from zero in the case of employment, no matter which fixed effects and controls are included (columns 1 and 2). We do find an effect, however, when we consider firm size heterogeneity in column 3. Interestingly, the coefficients on the interaction terms increase with firm size which implies that large firms base plans for future employment decisions on growth expectations. The same relationship with even larger coefficients holds for the sample elicited before the pandemic. Yet, the coefficients suggest an economically small effect.

The final columns of Table 9 display the results for backward-looking measures of employment. We find a similar pattern as in the forward looking case, both for the full

Table 10: Investment and Growth Expectations

	Forward looking				Backward looking		
				w/o 2020			w/o 2020
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Growth exp.	0.002**	0.001	0.001	0.000	0.002	0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.007)	(0.001)	(0.003)	(0.007)
Growth exp. × Firm size 2			0.001	0.003		0.001	0.003
			(0.002)	(0.009)		(0.003)	(0.010)
Growth exp. × Firm size 3			-0.002	0.033***		0.004	-0.015
			(0.003)	(0.011)		(0.004)	(0.013)
Growth exp. × Firm size 4			0.003	0.026*		0.001	0.037**
			(0.004)	(0.015)		(0.005)	(0.015)
Growth exp. × Firm size 5			-0.000	0.009		-0.002	0.062***
			(0.003)	(0.020)		(0.004)	(0.022)
Bus. exp.	0.144***	0.086***	0.086***	0.050***	0.017*	0.017*	-0.016
	(0.007)	(0.008)	(0.008)	(0.011)	(0.010)	(0.010)	(0.012)
Bus. ass.	0.154***	0.100***	0.100***	0.083***	-0.020*	-0.020*	0.008
	(0.006)	(0.009)	(0.009)	(0.012)	(0.011)	(0.011)	(0.013)
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No
Firm FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No	No
N	25,860	25,860	25,860	18,105	21,182	21,182	17,002
R^2	0.06	0.02	0.03	0.02	0.06	0.06	0.08

Notes: *p<0.1, **p<0.05, ***p<0.01. Standard errors clustered at county level in parentheses.

sample and the sample elicited before the pandemic. The larger a firm, the higher the degree to which changes in aggregate expectations are able to explain reported subsequent employment adjustments.

The results for the investment decisions are less clear-cut. In the case of the forward-looking measure, the coefficients have the expected sign but the estimate is significantly different from zero only without firm fixed effects in column 1. Firm size does not seem to play a role in the full sample (column 3). We observe some effects on investment plans for larger firms when excluding the 2020 survey (column 4). Similarly, when using the backward looking measure only estimates based on the sample without the pandemic survey wave suggest that large firms adjust investment in response to prior changes in their aggregate expectations (column 6).

Overall, we find that especially large firms seem to take their growth expectations into account when making managerial decisions (about employment and investment). We interpret this as a sign that firms might be aware of the quality of their expectations. Small firms know that their growth expectations are relatively uninformed. As a result it

is rational for them not to base decisions on those expectations. Large firms, in contrast, treat their growth expectations as valuable information, especially before the COVID-19 pandemic.

5 Conclusion

In recent years, macroeconomists have increasingly tried to understand how private households and firms form expectations about macroeconomic variables. Based on a large and fairly representative sample of German firms, this paper shows that local information—observed by firms in their industry, their region, or simply within the firm—influences the firms' expectations of aggregate growth.

Overall, our results highlight the importance of idiosyncratic and local information shocks to individual firms for understanding the dynamics of macroeconomic expectations. In particular, they offer an explanation for the observed cross-sectional expectation disagreement across firms. In total, local unemployment, industry growth, business expectations, business assessment, and price expectations (our measures of local information) increase the share of variation in expectations that we can explain by about 45 %. Replacing unemployment and industry growth with county and industry fixed effects even leads to an almost threefold increase in the explained variance share.

Our evidence complements findings in Andrade et al. (2022): our analysis covers not only the manufacturing sector but also the trade and service sectors, it is based on quantitative expectations of aggregate growth, and—due to our knowledge of the location of firms' headquarters—we can link expectations about aggregates to the regional economic situation rather than only to industry conditions. In addition, we provide evidence that the extrapolation from local information to expectation about aggregate growth is more pronounced for small firms than for large firms.

A drawback of our data set is the very small time dimension. Data on growth expectations is only available from four survey waves and for four target years. This precludes any analysis of dynamic effects like the ones shown in Andrade et al. (2022) and confines our study to an analysis of cross-sectional variation in the data.

Our results have implications for theoretical modeling of expectation heterogeneity in macroeconomic models. All four models that we consider (Lucas, 1972; Reis, 2006; Maćkowiak and Wiederholt, 2009; Angeletos and La'O, 2013) are consistent with dispersed macroeconomic expectations of firms. But only one version of the model framework with limited information processing capacities in Maćkowiak and Wiederholt (2009) is additionally consistent with dispersion being larger for small firms and an impact of local information shocks on expectations about aggregate variables. The other three models miss to explain at least one of those two additional empirical facts.

Going one step further, we provide evidence that growth expectations are related to firms' decisions about employment and investment, complementing evidence in Coibion et al. (2020). The effect is driven by larger firms and not visible for small firms. This suggest that small firms are aware of the limitations of their macroeconomic expectations and do not base their business decisions on them. Again, this speaks for models of rational expectations with information frictions rather than unconscious expectation biases.

From the perspective of firms, an overreaction to local information could lead to substantial misguided business decisions. We leave it to future research to analyze if firms that extrapolate from local information when forming growth expectations and, at the same time, react to these growth expectations when making employment and investment decisions suffer in terms of business performance in the medium term.

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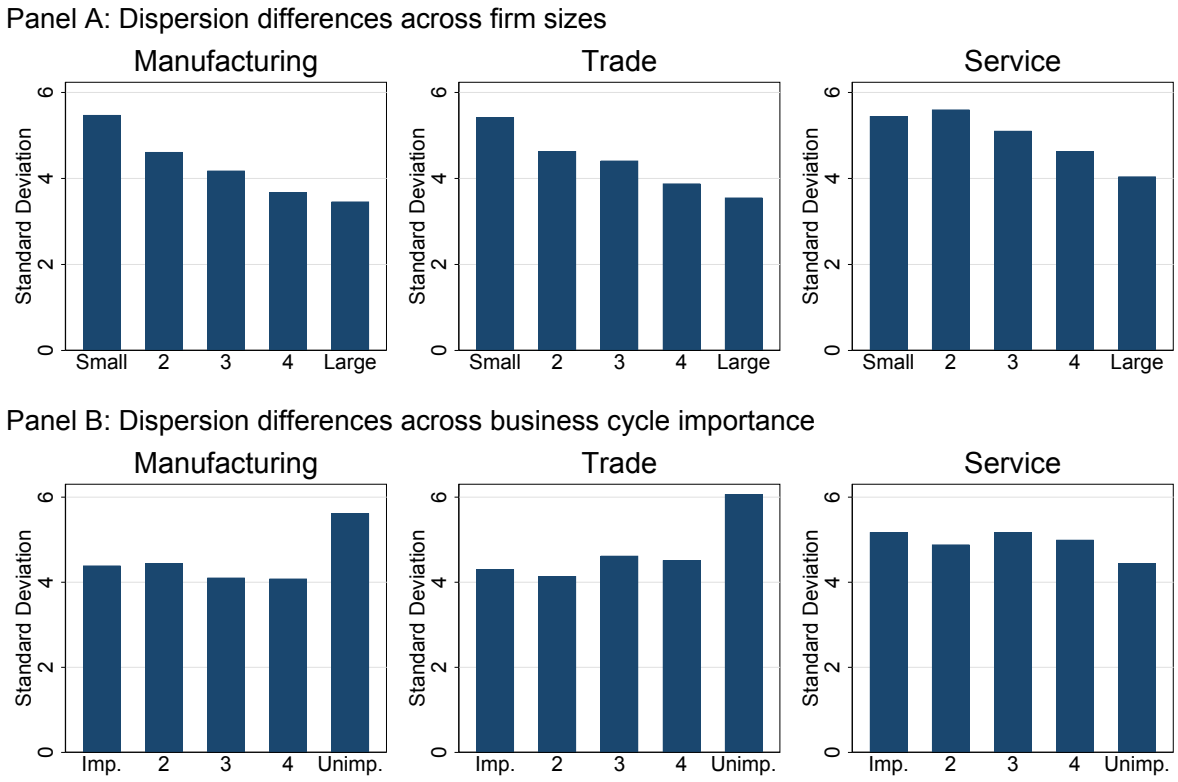
Appendix A Figures and Tables

Figure A.1: Dispersion of Growth Expectations for Different Firm Sizes and Levels of Importance of the German Business Cycle



Notes: The graphs show the standard deviation of firms' GDP expectations according to the five firm size categories and their assessment of how important the general economic situation in Germany is for their own business from 1 (important) to 5 (unimportant).

Table A.1: Descriptive Statistics for Quantitative Growth Expectations

Survey	Aug '18	Mar '19		Aug '19		Aug '20	
Expectation	2018	2019	2020	2019	2020	2020	2021
Manufacturing							
N	1,541	1,664	1,649	1,759	1,753	1,806	1,788
Mean	1.9	1.2	1.1	0.7	0.7	−6.7	1.8
Median	1.8	1.2	1.0	0.9	1.0	−8.0	3.0
Std. Dev.	1.3	1.5	1.5	1.5	1.8	7.0	5.6
Trade							
N	1,396	1,447	1,431	1,386	1,374	1,401	1,390
Mean	1.7	1.2	1.0	1.0	0.8	−4.5	1.5
Median	1.7	1.2	1.0	1.0	1.0	−6.0	2.0
Std. Dev.	1.1	1.3	1.4	1.5	1.7	8.4	6.0
Services							
N	1,704	1,720	1,694	1,711	1,704	1,803	1,783
Mean	1.9	1.3	1.3	1.1	0.9	−7.0	1.4
Median	1.8	1.3	1.1	1.0	1.0	−8.0	2.0
Std. Dev.	1.5	1.4	1.5	1.6	1.7	8.3	6.8

Notes: All numbers refer to the entire sample after dropping any observations that exceed the median by three standard deviations in each wave. In total, we drop about 1 % of all answers.

Table A.2: Descriptive Statistics for Other Variables

	N	Mean	Median	SD	Min	Max
GDP importance	5,302	2.13	2	0.90	1.00	5.00
Foreign sales	4,963	15.72	3	23.78	0.00	100.00
Unemployment (MA)	16,974	5.07	5	2.14	1.29	13.94
Industry growth	16,917	0.03	0	0.76	−2.80	4.27
Bus. exp.	19,311	−0.03	0	0.65	−1.00	1.00
Bus. ass.	19,326	0.20	0	0.71	−1.00	1.00
Investment forward	14,966	0.05	0	0.72	−1.00	1.00
Investment backward	6,994	−0.03	0	0.75	−1.00	1.00
Employment forward	19,191	0.04	0	0.52	−1.00	1.00
Employment backward	16,382	0.02	0	0.46	−1.00	1.00
Firm size	7,401	2.39	2	1.20	1.00	5.00
Dummy online	19,407	0.79	1	0.41	0.00	1.00
Hist. vol. business exp.	7,390	0.52	1	0.16	0.00	1.41
Success predicting own business	6,600	0.27	0	0.24	0.00	1.17
GDP - bus. ass. correlation	4,170	0.04	0	0.08	0.00	0.49

Notes: We calculate all descriptive statistics for each firm in each survey wave used in the analysis. Missing values are left out to ensure anonymity of firms.

Table A.3: Differences in Variances - Pooled Sample

	Firm size 1	Firm size 2	Firm size 3	Firm size 4
Firm size 2	0.8403***			
Firm size 3	0.6983***	0.8310**		
Firm size 4	0.5761***	0.6857***	0.8251***	
Firm size 5	0.4729***	0.5628***	0.6773***	0.8209***
Levene's statistic for the equality of variances between groups: 59.184***				

Notes: This table shows the results of variance ratio tests comparing the variances of growth expectations between two firm size groups and the Levene's test for the equality of variances between all firm size groups. The values in the upper panel of the table refer to the variance ratio. A variance ration smaller than one implies expectations of larger firms are less dispersed.

Table A.4: Differences in Variances - Pooled Sample

	GDP imp. 1	GDP imp. 2	GDP imp. 3	GDP imp. 4
GDP importance 2	0.9484**			
GDP importance 3	1.0050	1.0596***		
GDP importance 4	0.9561	1.0081	0.9513	
GDP importance 5	1.3495***	1.4229***	1.3428***	1.4115***
Levene's statistic for the equality of variances between groups: 2.035*				

Notes: This table shows the results of variance ratio tests comparing the variances of growth expectations between two groups of firms with different answers to the GDP importance question and Levene's test for the equality of variances between all groups. The values in the upper panel of the table refer to the variance ratio. A variance ration larger than one implies expectations of that firms that assign more importance to the German business cycle are less dispersed.

Appendix B Wording of Questions

The wording of the special questions in the BTS were as follows. To ask about the expectations for the annual growth rate of real GDP in 2018 we asked:

> Um wie viel Prozent wird sich Ihrer Einschätzung nach das reale Bruttoinlandsprodukt in Deutschland 2018 im Vergleich zum Vorjahr ändern?
>
> ___,___%

> *English translation (by authors)*:
> According to your assessment, by how much percent will the real gross domestic product in Germany change in the year 2018 relative to the previous year?
>
> ___,___%

To ask about the expectations for the annual growth rates of real GDP in 2019 and 2020 we asked:

> Um wie viel Prozent wird sich Ihrer Einschätzung nach das reale Bruttoinlandsprodukt in Deutschland in den unten genannten Jahren im Vergleich zum jeweiligen Vorjahr ändern? (Prozentangabe mit einer Nachkommastelle möglich.)
>
> 2019: ___,___% 2020: ___,___%

> *English translation (by authors)*:
> According to your assessment, by how much percent will the real gross domestic product in Germany change in relation to the respective previous year in the following years? (You can state your answer with one decimal.)
>
> 2019: ___,___% 2020: ___,___%

To elicit how important the German business cycle is for each firm we asked:

> Wie wichtig ist die allgemeine Konjunkturentwicklung in Deutschland für die Geschäftslage Ihres Unternehmens?
>
> ☐ sehr wichtig
> ☐ wichtig
> ☐ bedingt wichtig
> ☐ weniger wichtig
> ☐ unwichtig

English translation (by authors):
How important is the aggregate business cycle in Germany for the business situation of your firm?

- ☐ very important
- ☐ important
- ☐ somewhat important
- ☐ of small importance
- ☐ not important

To elicit the share of a firm's turnover made abroad we asked:

Wie viel Prozent Ihres Umsatzes erzielt Ihr Unternehmen / Betrieb im Ausland?

___%

English translation (by authors):
Which share of your firm's turnover is made abroad (in percent)?

___%