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Households' expectations and regional COVID-19 dynamics

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Non-technical summary

Research Question

The beginning of the COVID-19 pandemic was characterised by high uncertainty about the future path of the economy. In this paper, we examine how consumers in Germany updated their expectations about inflation for the next twelve months in response to the COVID-19 outbreak in early 2020. In particular, we explore if different levels of exposure to COVID-19 cases in connection with the economic circumstances in the district they live in led to heterogeneous responses among consumers when updating their inflation expectations. When examining the effects of experience on expectations, we differentiate between *local* (how severely the district was affected by COVID-19) and *personal* experience (how severely the respondent was affected financially).

Contribution

We use data from the Bundesbank Online Panel Households (BOP-HH), which contains information on inflation and other macroeconomic expectations of consumers living in Germany before and during the pandemic. We match consumer expectations with district level daily indicators on COVID-19 exposure and district-level containment measures. Thus, we can examine, through panel data analysis, how inflation expectations changed due to the pandemic outbreak. Moreover, we complement the regional indicators with households' subjective assessment of the local and personal-level experience, which could capture longer-lasting effects of the pandemic on expectations.

Results

We document a large upward shift in individuals' inflation expectations and an increase in individual uncertainty and disagreement about the future path of inflation immediately after the COVID-19 outbreak. An increase in the 7-day incidence by 50 is associated with an average increase by 0.9 percentage points in household inflation expectations. The relationship between the virus spread and inflation expectations is amplified if consumers live in high unemployment districts. We also find that local and personal experiences matter when forming expectations. Individuals that live in districts that were negatively affected by the pandemic and those that experienced losses to their households' finances have higher inflation expectations and are more pessimistic about unemployment, interest rates, and house prices. Our findings show that it is important to consider regional disparities when examining individual belief formation.

Nichttechnische Zusammenfassung

Fragestellung

Der Beginn der Corona-Pandemie war von hoher Unsicherheit im Hinblick auf die weitere wirtschaftliche Entwicklung geprägt. In dieser Arbeit untersuchen wir, wie die Erwartungen der Privatpersonen in Deutschland hinsichtlich Inflationsraten für die kommenden 12 Monate auf den COVID-19 Ausbruch Anfang 2020 reagiert haben. Wir untersuchen, ob die regionalen Corona-Inzidenzzahlen im Zusammenspiel mit der regionalen Wirtschaftslage dazu führten, dass Privatpersonen aus unterschiedlichen Regionen ihre Erwartungen unterschiedlich stark angepasst haben. Dabei unterscheiden wir danach, wie stark die Befragten durch das *lokale* Infektionsgeschehen in ihrem Kreis betroffen waren und wie stark sie tatsächlich *persönlich* betroffen waren, d.h., ob sie finanzielle Verluste infolge der Pandemie erlitten haben.

Beitrag

Wir verwenden für unsere Analysen Mikrodaten zu den Erwartungen von Privatpersonen in Deutschland aus dem Bundesbank-Online-Panel-Haushalte (BOP-HH). Die monatliche Befragung enthält Informationen zu den (Inflations-)Erwartungen vor Beginn der Corona-Pandemie und danach. Wir reichern die Daten zu Erwartungen um Informationen zu den täglichen Inzidenzzahlen auf Kreisebene an, um den Zusammenhang zwischen der Entwicklung der Pandemie und den Erwartungen der Privatpersonen im Zeitablauf untersuchen zu können. Längerfristige Auswirkungen der Pandemie auf Erwartungen versuchen wir dadurch abzuschätzen, dass wir die Analysen um Daten ergänzen, welche die subjektiven Einschätzungen der Befragten zum Einfluss der Pandemie auf ihre Region und sie persönlich widerspiegeln.

Ergebnisse

Die Inflationserwartungen der Privatpersonen erhöhten sich unmittelbar nach dem Ausbruch der Corona-Pandemie stark. Insbesondere nahm die Unsicherheit darüber zu, wie sich die Inflationsraten in Zukunft entwickeln werden; sowohl auf individueller Ebene als auch über alle Privatpersonen hinweg. Wir finden, dass ein Anstieg der Sieben-Tage-Inzidenz um 50 die durchschnittlichen Inflationserwartungen um 0,9% erhöht. Der Effekt ist besonders stark in Regionen, die durch eine hohe Arbeitslosigkeit

gekennzeichnet sind. Wir zeigen auch, dass die von den Personen auf lokaler und persönlicher Ebene wahrgenommenen Auswirkungen der Pandemie ihre Erwartungen beeinflussen. Die Personen, die durch die Pandemie finanzielle Verluste hatten, und Personen, die in besonders stark von der Pandemie betroffenen Kreisen leben, haben im Mittel höhere Inflationserwartungen und sind pessimistischer hinsichtlich der Entwicklung der Arbeitslosenquote, Zinsen und Immobilienpreise als andere Personen. Unsere Analysen zeigen, dass regionale Unterschiede bei der Erwartungsbildung von Privatpersonen eine Rolle spielen können und daher in entsprechenden Untersuchungen berücksichtigt werden sollten.

Deutsche Bundesbank Discussion Paper No 02/2023

Households' Expectations and Regional COVID-19 Dynamics

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Abstract

In this paper we analyze how consumers in Germany updated expectations about inflation in response to the COVID-19 outbreak. We use a fixed effects model to estimate the effect of regional exposure to COVID-19 cases, the stringency of restriction measures and local unemployment rates on inflation expectations. We find that consumers who were locally more exposed to COVID-19 cases report higher inflation expectations. The relationship between the virus spread and inflation expectations is amplified if respondents live in high unemployment regions. We explain our findings through an information and experience channel. Information about the pandemic and its effects played an important role during the first wave of the pandemic. However, when attention to information diminishes, experience matters most. We document that negative *personal* (how severely the respondent was affected financially) and *local experience* (how severely the district was affected by COVID-19) are associated with higher inflation expectations and more pessimistic views with regard to unemployment, interest rates, house prices and the intention to spend. Our findings show that it is important to consider regional disparities when examining individual belief formation.

JEL classification: E31, D14, D83, D84, G41, G51

Keywords: COVID-19 pandemic, inflation expectations, inflation disagreement, perceived severity of COVID-19, personal experience

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1. Introduction

The COVID-19 pandemic was an unprecedented health and economic shock which had a dramatic effect on the economy. An important aspect of the uncertainty it created had to do with inflation. The very specific nature of the shock made it hard to predict whether it would lead to inflationary or deflationary pressures. Therefore, discussions on inflation and its future evolution were at the center of the policy debate and received considerable attention by central banks. To support the discussion, a thorough understanding of how agents update their beliefs after a large and unexpected shock such as the outbreak of the COVID-19 pandemic is crucial for current and future policy responses.

In this paper we examine how exposure to the *pandemic* affects consumers' macroeconomic expectations and, in particular, inflation expectations. We use data from the Bundesbank Online Panel Households (BOP-HH), a monthly survey conducted by the Deutsche Bundesbank to track the development of consumers' expectations throughout the pandemic. The survey started in 2019 and has a panel dimension, which allows us to address unobserved heterogeneity by tracking the same individual over time. We focus mainly on the first wave of the pandemic in order to clearly disentangle the effect that comes from COVID-19 exposure from the effect that comes from policies undertaken later during the pandemic to control the virus and other major events that followed as the pandemic unfolded.[1] Furthermore, the survey has a good regional coverage, which we exploit to link individual expectations with local COVID-19 exposure indicators, a stringency indicator for the containment measures and the regional unemployment rate.

We start by comparing consumers' inflation expectations before and right after the pandemic shock. We document that the pandemic shifted consumers' expectations considerably and this effect was more pronounced during the first wave of COVID-19 (April-July 2020). Before the pandemic outbreak, average inflation expectations of the respondents in our sample were approximately 3% and increased to 3.5%. In April 2020, median inflation expectations increased

[1] We are also partially restricted by the panel structure of the survey. In 2019, the survey was still in a pilot phase and there was no clear panel structure. After August 2020 a rotating panel design was adopted.

from 2% in 2019 to almost 3% and returned to the pre-pandemic level only in August 2020.[2]

COVID-19 cases and economic vulnerabilities the pandemic created did not spread evenly across regions. Therefore, we investigate whether it was indeed the virus spread or any further interplay between COVID-19 severity and local economic conditions that lead to a heterogeneous response in terms of consumers' expectations. The results from a fixed effects model indicate that households who were exposed to a higher number of *COVID-19 cases* reported on average higher inflation expectations. We find that during the initial phase of the COVID-19 pandemic an increase by 50 in the 7-day incidence was associated with an increase in inflation expectations by approximately 0.9 percentage points. We also look at the heterogeneity arising from the interplay between the severity of COVID-19 and the regional economic development. In this regard, we find that respondents who live in regions with high unemployment rates report higher inflation expectations as a response to local COVID-19 exposure. These findings show that there is a strong interplay between local economic conditions and the virus spread when it comes to forming expectations about aggregate economic outcomes and it is the *economic impact of COVID-19* that consumers fear most.

To understand the mechanism that connects the exposure to the pandemic with inflation expectations, and particularly why the economic impact of the virus spread matters most, we look at two potential channels: (1) *information* and (2) *experience* effects.[3] In the context of our research question we examine the role of information related to the pandemic. Information dissemination played an important role during the pandemic to contain the virus spread. Government and local agencies intensified their reporting of COVID-19 cases to make the public aware and cautious. At the same time, the public received information not only about

[2]It should be noted that this return to the pre-pandemic level of the median inflation expectations was only temporary. From mid-2021 inflation expectations started to increase again due to other factors such as higher energy prices. However, this is beyond the scope of this analysis which has as its main focus disentangling the effect that arises from the pandemic spread and severity.

[3]The role of information is well documented in the literature on expectation formation (Blinder, Krueger, & Nordhaus, 2004; Candia, Coibion, & Gorodnichenko, 2020; Conrad, Enders, & Glas, 2022; D'Acunto, Malmendier, Ospina, & Weber, 2019) Several studies show that individual expectations about macroeconomic variables can vary due to different information exposure. For example, D'Acunto et al. (2019) find that exposure to price changes while grocery shopping influences individuals' overall inflation expectations. Furthermore, informing individuals about past inflation or other aggregate economic variables can influence their expectations (Candia et al., 2020; Coibion, Georgarakos, Gorodnichenko, & Van Rooij, 2019; Coibion, Gorodnichenko, & Kamdar, 2018). Blinder et al. (2004) show that television and newspapers are the main channels US consumers use to inform themselves about economic developments.

the spread of the virus, but also about its potential implications for the economy, particularly inflation. Nevertheless, for the information on the pandemic spread and its effects on the economy to be relevant in the expectation formation process, individuals need to be aware of the news to begin with. We document that survey participants follow attentively the news regarding the pandemic progression and its economic impact and they have a good understanding of both.

However, it is worth highlighting that people's attention to information, as well as their behavior, did not stay constant throughout the different phases of the pandemic. As described by Brunnermeier (2021) the behavior of individuals during the first phase of the pandemic was characterized by fear, which induced people to change their behavior independent of social restriction measures in place (Chetty, Friedman, Hendren, & Stepner, 2020). As the pandemic unfolded, people's fear about the pandemic was replaced by fatigue and individuals were less likely to adjust their behavior in response to increasing cases (Brunnermeier, 2021). This pattern is also documented by Mitchell and Liedke (2022) who find that the peak in public attention to COVID-19 related news was observed in March 2020, during the early stages of the pandemic. Obviously if attention declines what could prevail over the importance of actual information is people's own assessment and perception of the situation. In this scenario, hard facts and information have less influence on the expectation formation process and it is local and personal experience that linger on that shape peoples' expectations about economic outcomes (Conrad et al., 2022; Ehrmann, Pfajfar, & Santoro, 2017). As the role of information dies down, what in the longer term can be an important driving factor in expectations formation is what people perceived and experienced during the pandemic.

To assess the additional channel of experience, we ask respondents in two waves of the survey to report their own subjective assessment about the past experience throughout the pandemic. Following Malmendier (2021), when considering experience effects, we jointly consider both *local* and *individual-level* experiences.[4] We show that both types of experiences matter when forming inflation expectations. The perception that the coronavirus affected the

[4]The former is related to the perceived severity of the pandemic on the economy of the district where the respondent lives. The latter directly considers individuals' personal losses during the pandemic.

local economy negatively is associated with higher inflation expectations. In terms of personal experience, the stronger the impact of the pandemic was on household finances, the higher the expected inflation rate and uncertainty.

Last, we document that households think of the pandemic as a supply side shock and hence, they expect not only higher inflation, but also lower economic growth, lower income growth, and a higher unemployment rate. Furthermore, individuals that perceive the impact of COVID-19 on the economy as severe and those that were negatively affected personally during the pandemic are more likely to report that they plan to spend less on major purchases and save more in the next 12 months.

In summary, the COVID-19 pandemic initially had a major impact on individuals' expectations in Germany. We argue that information about the pandemic played an important role during the first wave of the pandemic. However, in the consecutive waves of the pandemic what prevailed was individuals' experiences. The latter channel of experience matters when considering potential long-term impacts of the pandemic on individuals' expectations. Whether it will have long-lasting effects remains to be seen in the course of time.

Our results contribute to several strands of the literature: this paper is closely related to the literature that examines how the outbreak of the COVID-19 pandemic affected inflation expectations of households. Binder (2020) finds that greater concern about the COVID-19 pandemic is associated with higher inflation and unemployment expectations. Armantier et al. (2021) on the other hand document that the outbreak of the pandemic was not associated with any major upward or downward trend in inflation expectations, but with higher uncertainty and disagreement. Coibion, Gorodnichenko, and Weber (2020) find that households' expectations became considerably more pessimistic and inflation expectations decreased as an immediate result of the pandemic. Fetzer, Hensel, Hermle, and Roth (2021) link the pandemic risk factors such as contagiousness and mortality rate directly to increasing economic fears during the pandemic. This paper together with Binder (2020) suggests that the virus spread itself can affect consumers' beliefs about the economy directly through increased fears due to the virus spread. In contrast to the US, there is no evidence on the effect of the pandemic on inflation

expectations of German households. [5]

We contribute to this literature in two ways. First, we provide evidence on how inflation expectations of German households evolved before and during the pandemic. In contrast to studies for the US (Armantier et al., 2021; Coibion, Gorodnichenko, & Weber, 2020), we find that German households on average respond to the outbreak of the pandemic with higher inflation expectations. Second, we add to this strand of literature by examining not only the overall effects, but also potential regional heterogeneities of the impact of COVID-19 on inflation expectations. Households that live in regions with higher unemployment rates react to the outbreak with higher inflation expectations as compared to households that live in better off regions.

Another strand of literature closely related to this paper are the studies on personal and local experience effects on expectations and future behavior. Kuchler and Zafar (2019) use regional variation in locally experienced house prices to show that people extrapolate from the prices experienced at regional level when expressing expectations about country-level price changes. The seminal paper by Malmendier and Nagel (2011) shows that experiencing a large macroeconomic shock affects financial risk taking in the future. Furthermore, Malmendier and Shen (2018) document the importance of considering simultaneously the role of macro, local and individual-level experiences (for a review of the literature see Malmendier (2021)). Goldfayn-Frank and Wohlfart (2020) provide evidence for Germany on how experiencing a large inflation shock after reunification permanently impeded households' inflation expectations formation process for those who lived in the German Democratic Republic (GDR). More recently, Bu, Hanspal, Liao, and Liu (2020) find that locally or closely experienced shocks during the COVID-19 outbreak in China can affect the risk taking behavior of households through a channel of beliefs and expectations.

We contribute to this literature by matching households' district level exposure to COVID-19 incidence to the local economic development indicators and household specific macroeconomic expectations. Furthermore, we complement the regional indicators with households'

[5] A related study is Coleman and Nautz (2020) who document in a survey conducted from January 2019 until May 2020 that credibility of inflation targets has decreased especially during the COVID-19 pandemic. However, they do not look at how inflation expectations changed during the pandemic.

subjective assessment of the local-level experience and their personal experience. We document that experience at the local level matters when forming macroeconomic expectations for the next 12 months, even after controlling for individual-level shocks that the household experienced during the pandemic.

Finally, our paper is broadly related to the studies that empirically examine the link between inflation expectations, uncertainty and economic behavior (Coibion et al., 2019; Crump, Eusepi, Tambalotti, & Topa, 2015; D'Acunto, Hoang, & Weber, 2016; Dräger & Nghiem, 2018). Our work complements this literature by examining how people's perception of the impact of the pandemic is correlated with their intentions to make major purchases and their incentive to save in the future.

The paper is structured as follows: section 2 provides a detailed description of the data we use for the analysis and some descriptive evidence. In section 3 we explain the identification strategy and provide results from the fixed effects model estimation. In section 4 we analyze the importance of information during the pandemic as a potential mechanism through which local COVID-19 cases and economic indicators can influence expectations. In section 5 we report further results on the role of subjective local and individual-level experiences in shaping consumers' macroeconomic expectations. We conclude in section 7.

2. Data and Descriptive Evidence

In this section we describe the features of the data we use for the analysis. We combine monthly micro data on consumer expectations before and during the pandemic with district-level information on the spread of the virus, the stringency of containment measures and economic development. Afterwards, we report some descriptive results on how consumers' expectations about inflation developed at the onset of the COVID-19 pandemic in Germany.

2.1. Data

The analysis is based on micro data from the Bundesbank Online Panel for Households (BOP-HH). The survey tracks consumers' expectations with regard to inflation, interest rates, house prices and rents, as well as other subjective expectation measures over time. It was carried out for the first time in April, May and June 2019 and has continued on a monthly basis from April 2020 onwards. The respondents are selected randomly from an online panel that is recruited offline. It targets individuals that are 16 years or older with internet access. Hence, the sample is weighted to be representative of the online population (Beckmann & Schmidt, 2020). The survey includes a sample that ranges between 2,000 and 5,000 respondents each month. In addition, the BOP-HH has a broad regional coverage and contains information on the exact day of the interview for each respondent, allowing us to match individual-level information with COVID-19 data from the Robert Koch Institute (RKI), a stringency index of district-level containment measures from the official "*Corona Data Platform*" of the Federal Ministry of Economic Affairs and Energy and regional economic indicators from the Statistical Offices of the German States and the Federal Employment Agency. We provide a comprehensive description of the variables and their sources in Appendix G.

As mentioned before, a major advantage of using the survey is its panel dimension. In this way we can examine how individual households revise their expectations from 2019 (before the pandemic) to 2020 (during the pandemic). The BOP-HH covers quantitative measures of inflation expectations and qualitative measures of other macroeconomic expectations before the COVID-19 outbreak for three consequent months, from April to June 2019. For the pandemic period, it is important to emphasize that we restrict the panel data analysis to include only April to July 2020. The reasons we do so are twofold. First, to rely on a clear panel dimension from 2019 to 2020, which is crucial when controlling for individual-level time-invariant unobserved heterogeneity.[6] Second, we focus only on the first wave of the pandemic to reduce potential endogeneity arising from other factors influencing expectations

[6]The BOP-HH was in its pilot phase in 2019 where there was no clear panel design in place. From August 2020, it was set for a rotating panel design. Thus, a clear panel component from 2019 to 2020 is mostly available until July/August 2020.

beside the virus spread. During the first wave of the pandemic, as opposed to the second, containment measures were implemented homogeneously among all the German states. As a result we can exploit the heterogeneity arising from the share of cases in each district while controlling for the stringency of the measures in place. Equally important is the fact that during the early phase of the pandemic there were no other major events occurring that could influence individuals' expectations such as for example the announcement or approval of the first vaccines. Overall, the sample for our analysis contains around 12,000 observations for the panel data analysis (April to June 2019 and April to July 2020).[7]

To provide evidence on the mechanism behind the individuals' inflation expectation formation process we complement our analysis with specific question designed for the purpose of this analysis. The additional questions were fielded in two follow-up waves of the BOP-HH, namely in November 2020 and May 2021. The total number of observations in these two waves is more than 6,000 observations altogether.

2.2. Variable description

Inflation expectations and uncertainty. In the BOP-HH, inflation expectations are measured in three ways.[8] First, in the simplest form, individuals are asked whether they believe inflation will decrease significantly, decrease slightly, stay the same, increase slightly, or increase significantly in the next 12 months. We will refer to this as the qualitative indicator. Second, the survey elicits point forecasts of year-ahead inflation. Respondents are asked the following question: *"What do you think the rate of inflation (deflation) will roughly be over the next 12 months?"*. We use this question to measure consumers' *expected inflation*. To avoid extreme outliers' effect we winsorize the variable at the 2nd and 98th percentiles for each period.[9] Lastly, the survey elicits subjective probability distributions over ten bins for future

[7] The total number of observations varies depending on the variables we use to measure inflation expectations and the control variables we include. Therefore the sample size changes depending on the specification.

[8] The full questionnaires can be downloaded from: https://www.bundesbank.de/en/bundesbank/research/survey-on-consumer-expectations.

[9] There is no overall agreement in the literature on subjective inflation expectations on how to best approach the issue of extreme outliers. For example, Dräger and Nghiem (2018) truncate the inflation rate reported by consumers in the range [-15%,15%]. Ehrmann et al. (2017) restrict their analysis to the sample of households that report values between [-5%,30%].

inflation where respondents are asked to assign probabilities to predetermined bins on the expected inflation rates in the next 12 months. We use the probabilistic question to construct two type of variables: i) the probability that the consumer assigns to inflation falling in a specific interval and ii) uncertainty. For the former we distinguish four inflation scenarios: 1) a deflation scenario materializing; 2) inflation falling int the interveral 0% and 2%; 3) inflation falling between 2% and 4%; and 4) a high inflationary scenario where consumers give a probability to inflation taking values higher than 4% in the next 12 months. For latter variable, the uncertainty about inflation in the next 12 months, we follow a similar approach to Coibion, Gorodnichenko, Kumar, and Pedemonte (2020) where uncertainty is captured as the standard deviation of the consumer's subjective distribution. We assume that the probability mass is concentrated at the midpoint for each bin.

Inflation disagreement. We measure disagreement for each month as the standard deviation (SD) or the interquartile range (IQR) of the distribution of the point forecast estimates reported by the respondents in a specific survey wave.

Other macroeconomic indicators. For the other macroeconomic expectations variables, the BOP-HH mainly uses qualitative questions where households are simply asked whether they expect economic growth, unemployment, interest rates, house prices and rents to increase, decrease or stay the same. In one wave, in November 2020, the survey included a probabilistic question on individuals' expectations about the future development of GDP growth. The exact wording for each of the questions related to households' subjective expectations is provided in Appendix G.

Coronavirus severity. To capture the pandemic severity we use the 7-day incidence that the respondents experience in the district where they live on the day of the interview. Matching to the exact day is possible because BOP-HH contains information on the exact day the consumer answered the survey. The 7-day incidence is a widely used indicator published regularly on the website of the Robert Koch Institute and the Corona Data Platform.[10] It is calculated as the total number of new coronavirus infections within the past seven days per 100,000 inhabitants in the district. We prefer the 7-day incidence to other measures of the

[10] Corona Data Platform: 7-day incidence

spread of COVID-19 because it captures the latest developments with regard to the COVID-19 situation in the region and does not reflect any path dependency related to the initial introduction of coronavirus cases in the country. The 7-day incidence is a proxy for how strongly the region is affected by the pandemic on the day of the interview.

Local and individual-level experience. To capture experience we designed two follow-up questions that were fielded in November 2020 and May 2021. We capture the *local experience* of the respondents during the pandemic with a question where they are asked to provide a subjective assessment of the pandemic effect on the local economy, while *individual-level experience* is related directly to the financial losses the respondent's household experienced during the pandemic. Unfortunately, these two questions are not available for the period between April to July 2020. During this period we rely on a similar question that captures individuals' degree of concern during the pandemic. However, these alternative question has the shortcoming that it does not focus on the local or individual experience of the household.

Controls. We control for selected respondents' socio-demographic characteristics: age, gender, education, income, whether they live in an urban area, and if they were living in the GDR before 1989.[11] To control for the stringency of coronavirus measures in place we include an index constructed by infas 360 GmbH and disseminated through the Corona Data Platform.[12] It is a daily index constructed for each district that varies from 0 to 100 depending on the level of stringency of containment measures in place. In addition, we control for district-level economic indicators. To measure the economic impact of the pandemic shock at the local level we use the unemployment rate of the district which is provided by the Federal Employment Agency at monthly frequency. Moreover, for the cross-sectional analysis we include economic indicators that capture the sectoral composition in the region before the outbreak of the pandemic. These include the share of employees in the service sector, overnight stays, the share of employees in knowledge-intensive industries and the share of workers with an academic degree.[13] A detailed description of all the variables is provided in Appendix G and

[11] Depending on the type of analysis either panel data analysis or cross-sectional analysis, the type of control variables change depending on their time-variation. For example, we do not include time-invariant variables in the panel data analysis.

[12] Corona Data Platform: Stringency index for each district per day

[13] The regional characteristics do not vary over time. Therefore, later on, we include them only in the cross-

the summary statistics for all the variables are provided in Appendix A.

2.3. *Descriptive results: inflation expectations before and during the onset of the COVID-19 pandemic*

We start by providing descriptive evidence on the development of inflation expectations before and during the COVID-19 pandemic. We document in Figure 1 how measures of central tendency, uncertainty and disagreement changed as the pandemic unfolded. Panel A of Figure 1 shows how the *average* and *median* of consumers' expected inflation evolved over time. Additionally, to understand if individual expectations departed substantially from the actual inflation rate in Germany, we add the latter to the plot.[14]

Before the outbreak of the virus, in 2019, households' average inflation expectations were around 3% for the point forecast measure. In April 2020, average inflation expectations of German households increased to approximately 4.5%. The median increased from 2% to 3% and remained elevated during the first phase of the COVID-19 pandemic. It did not return to the pre-pandemic levels until August 2020, when coronavirus cases started to decrease in Germany. An important aspect to emphasize in panel A of Figure 1 is the large divergence between actual and expected inflation that emerged after the COVID-19 outbreak. While many policy analysts and economists were worried about the potential deflationary pressure of the pandemic, it is evident that households, on average, were expecting the pandemic to result in higher short-term inflation.

We plot individual uncertainty for one-year ahead inflation in panel B of Figure 1. It is worth noting that, unlike the average inflation expectations, uncertainty increased after the outbreak of the pandemic and did not return to pre-pandemic levels for the period we report until December 2020. The findings on the inflation uncertainty upsurge is consistent with other evidence from studies conducted in the US (Armantier et al., 2021; Coibion, Gorodnichenko, & Weber, 2020). An additional trait of inflation expectations during the initial wave of the

sectional analysis and not for the fixed effects model.

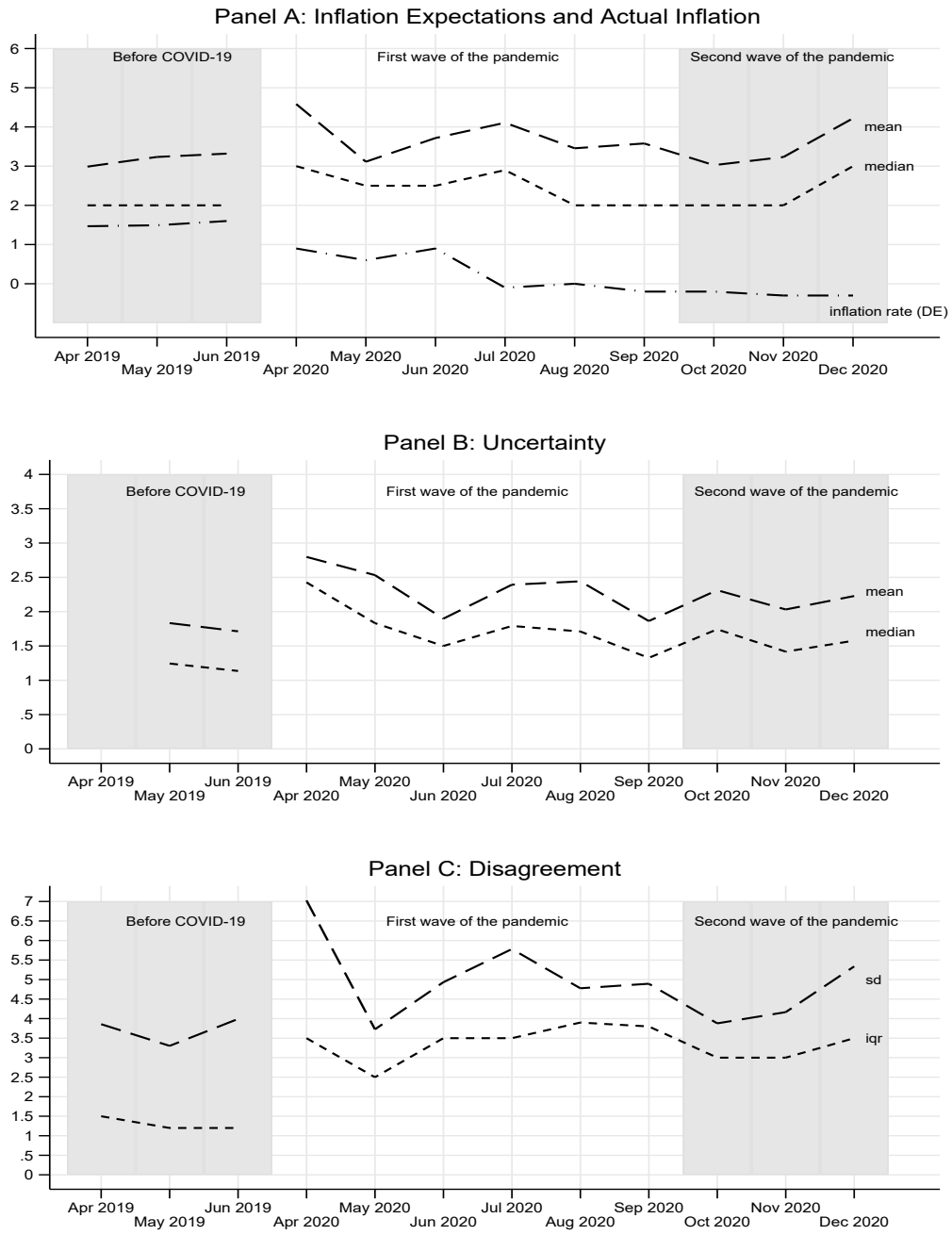
[14]The Federal Statistical Office (Destatis)

pandemic was an increase in disagreement among respondents. In panel C of Figure 1 we plot the disagreement measured as SD and IQR. Again, it is noticeable that the largest shock occurred in April 2020 and the disagreement among the survey respondents remained high until the end of our observation period as compared to the pre-pandemic period.

In Table1 we confirm the previous graphical results. We report statistics of all the expectation variables covered in our analysis and the difference between the pre-pandemic (April-June 2019) and the pandemic period. The sample corresponding to the pandemic period is restricted to the first wave of COVID-19 outbreak that includes April to July 2020 as discussed earlier. Mean inflation expectations increased on average by approximately 0.5 percentage point and the difference is significant at the 95% confidence interval. However, as displayed in Figure 1 and Figure B1 in the appendix, the average value does not tell the full story. Subjective uncertainty and disagreement among individuals increased as well. In Table 1 disagreement is reflected in the fact that both the probability assigned by respondents to inflation falling in an interval less than zero (i.e. expecting deflation) and in an interval where the inflation expectation is larger than 4% increased. The average probability that respondents assigned to a deflation scenario before the pandemic was 11.7% and it increased for the pandemic period to 21.4%. Similarly, the chances assigned to a scenario where inflation is larger than 4% increased from 14% to 22%. The probabilities assigned to inflation falling in the range 0% to 4% decreased after the coronavirus outbreak, indicating a further departure of short-term inflation expectations from the central bank's objective.

In sum, the descriptive results indicate that respondents reacted to the pandemic with higher average inflation expectations and uncertainty and more disagreement. Furthermore, consumers' reported pessimistic expectations about unemployment rates, house prices and rents. The next chapter, moves on to investigate more thoroughly the role of regional, within-country differences in COVID-19 exposure on inflation and other macroeconomic expectations.

Figure 1. Inflation expectations during the pandemic



Notes: The figure shows how average inflation, uncertainty and disagreement about the inflation forecast of households changed from April to June 2019 (before the pandemic) to April to December 2020 (during the pandemic). Panel A shows how measures of central tendency evolved over time. Panel B shows how individual uncertainty evolved over time. Individual uncertainty is measured as the standard deviation in the subjective distribution of the respondents. Panel C shows how disagreement about the inflation rate, measured as SD and IQR, evolved over time. In panels A and C, the quantitative inflation measure is winsorized at the 2nd and 98th percentiles for each period. In panel B we use the probabilistic inflation measure as described in section 2.2. The results are weighted.

Table 1: Before and during COVID -19: mean difference

	(1) Before COVID-19 mean	(2) During COVID-19 mean	(3) Difference in means	
E. Inflation	2.97	3.42	0.45***	(0.00)
Pr (Less than 0)	11.67	21.38	9.71***	(0.00)
Pr (0,2)	45.35	31.03	-14.32***	(0.00)
Pr (2,4)	28.69	25.33	-3.36***	(0.00)
Pr (more than 4)	14.29	22.26	7.97***	(0.00)
Strong Incr. Infl.	0.11	0.23	0.12***	(0.00)
Infl. uncert.	1.58	2.06	0.48***	(0.00)
Observations	6082	6503	12585	

Notes: The table shows the difference in mean results between the average expectations before and during the COVID-19 pandemic. Column (1) reports the average values for the pre-pandemic period. Column (2) reports the average values for the pandemic wave. Column (3) reports the difference between pandemic and pre-pandemic averages and the respective p-values. E.Inflation is the expected inflation rate in the next 12 months, measured as a point prediction. Bias(infl) is the difference between expected inflation rate and the current observed CPI inflation rate. Pr (Less than zero) is the probability of expecting inflation realizations that are less than zero. Pr (0,2) is the probability of expecting inflation between 2% and 4%. Pr (2,4) is the probability of expecting the inflation rate to fall between 2% and 4%. Pr (more than 4) is the probability of expecting the inflation rate to be more than 4%. Strong Incr. Infl. is a dummy variable that is equal to 1 if individuals expect a strong increase in inflation in the next 12 months and zero otherwise. It is constructed from the qualitative indicator. Infl. uncert. is the inflation uncertainty which is captured from the standard deviation of the consumer's subjective distribution. ***, **, * indicate statistical significance at 1, 5 and 10 percent.

3. Regional COVID-19 Dynamics: Panel Data Evidence

We have already seen from the descriptive results presented above, that the COVID-19 pandemic affected inflation expectations. In this section we look at how the severity of the pandemic matters. For identification we use the regional heterogeneity of the spread of the virus. To control for unobserved factors potentially driving differences in individuals' expectations, in section 3.1 we estimate fixed effects models, controlling for regional and individual fixed effects. Then, in section 3.2, we explore the role of regional economic conditions in amplifying the effect of COVID-19 on expectations.

3.1. The role of disease infectiousness

Local exposure to COVID-19, measured as the 7-day incidence in the district, was an important indicator of the pandemic progression and severity. It was used extensively by local and

central authorities for communicating to the public and determining confinement regulations. Higher local COVID-19 cases not only indicated a higher probability of having restrictions in place, but also a higher chance of contracting the virus and possibly a longer lasting-public health crisis. Therefore, observing higher numbers of coronavirus cases, or a faster progression of the pandemic in the district could result in increased fears and concerns which could be related to higher or lower inflation expectations depending on whether consumers believed that the coronavirus would result in a supply or demand shock. Another explanation, in line with findings from Binder (2020) and Kamdar (2019), is that consumers just associate COVID-19 with a bad economic outcome that results in overall lower economic growth, high unemployment and inflation. To determine the effect of COVID-19 progression on respondents' expectations, we use the following specification to estimate a fixed effect model:

$$Y_{ijt} = \beta_0 + \beta_1 7\text{DayIncidence}_{ijt} + \beta_2 \text{Individual}_{it} + \delta \text{Regional}_{jt} + \alpha_i + \text{YearFE} + \epsilon_{ijt} \quad (1)$$

where index *i*, *j* and *t* indicate individual, district and time, respectively. *t* is at monthly frequency and includes April, May and June 2019 (the pre-pandemic period) and April to July 2020 (the pandemic period). Y_{ijt} is an outcome variable that represents: (i) the inflation expectation of individuals as a point forecast; (ii) the probability assigned to inflation falling in one of the intervals (less than 0, between 0 and 2, between 2 and 4, more than 4); (iii) individuals' expectations about inflation measured as a qualitative indicator; and (iv) individuals' subjective uncertainty about their inflation forecast. The main explanatory variable, the 7-day incidence, captures the progression of the pandemic in the district where the respondent lives. We control for the respondents' age, net income, education, home ownership status and whether they live in an urban area. We also add a subjective measure of concern in relation to the pandemic and the economy, where consumers are asked about the extent to which they think the recent developments related to the coronavirus pandemic and the economy are a serious problem. The variable ranges from one (no problem at all) to ten (a serious problem). To isolate the effect of the COVID-19 spread from the lockdown policies we add a control that captures the stringency of containment measures that were in place in the district. It is worth noting that this is not a major issue for the time frame of our analysis because during the

first phase of the pandemic social distancing measures were implemented at state level and they varied very little at district level. All the measures were coordinated by the central government and applied by all states in a similar effort. To control for the differential economic impact of the pandemic on the real economy we include data from the Federal Employment Agency on the unemployment rate at district level. We also include individual and year fixed effects.

We report the results from the fixed effects model with individual and year fixed effects in Table 2. The results suggest that on average, an increase in coronavirus severity experienced by individuals leads to higher inflation expectations. An increase in the 7-day incidence by 50 in the district where the respondent lives is associated with an increase in inflation expectations by 0.9 percentage points on average (column 1). Corroborating the descriptive results in Figure 1, it is apparent from the results in columns 2 to 5 that respondents increase the average probability assigned to the intervals that correspond to high inflation (more than 4%) and decrease the probability assigned to the interval that lies between 0% and 2%. Overall, the results remain similar when we conduct further robustness checks such as clustering the standard errors both at individual and district level (Table D1) and the inclusion of month fixed effects (Table D2).

The stringency index does not matter in explaining the change in inflation expectations. This result is expected, since we argued previously that the restrictions in place during the first wave of the pandemic were very similar because Germany implemented a national lockdown. Therefore, the variation in the severity of the pandemic resulted mainly from different exposure to the 7-day incidence in the district. Nonetheless, respondents that live in regions with stricter measures assign on average higher probability to the interval in which inflation will be "above 4%" next year. Another important explanatory variable for inflation expectations is individuals' subjective concerns about the implications of the pandemic for the economy. Individuals that believe that the pandemic is a severe problem ("*Economy a problem*") have, on average, higher inflation expectations (columns 1, 2, 6), while, the subjective measure of concerns related to the pandemic ("*Coronavirus a problem*"), which asks individuals to what extent they consider the coronavirus situation a problem, is statistically not significant.

Table 2: The effect of the 7-day incidence on inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	E. Inflation	Pr (<0)	Pr (0 - 2)	Pr (2 - 4)	Pr (>4)	Strong Incr.	Uncertanty
7-day inc.	0.018***	-0.030	-0.076**	0.011	0.096**	0.00056	0.0042*
	(0.01)	(0.03)	(0.03)	(0.04)	(0.05)	(0.00)	(0.00)
Unempl. (monthly)	-0.12	-1.59	-2.36	4.53**	-0.57	-0.063***	-0.33***
	(0.19)	(1.48)	(2.16)	(2.17)	(2.50)	(0.02)	(0.10)
Stringency index	0.0063	0.13*	-0.33***	0.028	0.17**	0.0013	0.035***
	(0.01)	(0.07)	(0.09)	(0.08)	(0.07)	(0.00)	(0.01)
Exp. restrictions	-0.022	0.18	0.026	-0.26**	0.058	-0.0015	0.014*
	(0.01)	(0.13)	(0.13)	(0.13)	(0.13)	(0.00)	(0.01)
Coronavirus a problem	-0.0076	-0.071	0.14	0.18	-0.25	-0.0016	-0.024
	(0.05)	(0.32)	(0.35)	(0.35)	(0.34)	(0.00)	(0.02)
Economy a problem	0.12**	-0.090	-0.37	-0.58	1.05***	0.016***	0.014
	(0.05)	(0.31)	(0.39)	(0.37)	(0.35)	(0.00)	(0.02)
Age	0.18	-1.97	3.24**	0.42	-1.69	-0.048***	0.067
	(0.17)	(1.33)	(1.49)	(1.40)	(1.30)	(0.01)	(0.07)
With college degree	0.21	2.73	-8.05	3.26	2.05	0.042	-0.075
	(0.52)	(4.29)	(5.83)	(5.26)	(4.22)	(0.05)	(0.26)
Income: EUR 2500 - EUR 4000	-0.38	1.49	-2.73	2.64	-1.39	0.0080	0.093
	(0.28)	(2.24)	(2.61)	(2.37)	(2.66)	(0.02)	(0.17)
Income: more EUR 4000	-0.81**	2.13	-3.50	5.40*	-4.02	-0.0081	-0.053
	(0.38)	(2.84)	(3.53)	(2.95)	(3.30)	(0.03)	(0.20)
Owner	-0.12	-3.38	3.06	1.66	-1.33	-0.030	-0.072
	(0.63)	(3.13)	(4.87)	(4.80)	(4.53)	(0.04)	(0.22)
Urban	-2.56*	11.5***	28.9	-44.6	4.31**	0.097***	0.65
	(1.41)	(1.41)	(29.65)	(28.33)	(2.15)	(0.02)	(0.56)
Year Dummy (2020)	-0.85	9.59*	2.32	-8.16	-3.75	0.11*	-0.58
	(0.76)	(5.31)	(6.31)	(6.13)	(5.13)	(0.06)	(0.37)
Observations	12585	10271	10271	10271	10271	12887	9861
Adj. R^2	0.0076	0.034	0.041	0.0100	0.024	0.030	0.048
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the results of a fixed effects regression model with robust standard errors clustered at district level. It includes individual and year fixed effects. The period of analysis includes April to June 2019 (pre-pandemic period) and April to July 2020 (first wave of the COVID-19 pandemic). The dependent variables for each column are the following: (1) Expected inflation measured as a point prediction; (2) Probability of expecting inflation realizations that are less than zero; (3) Probability of expecting inflation between 2% and 4%; (4) Probability of expecting the inflation rate to fall between 2% and 4%; (5) Probability of expecting the inflation rate to be more than 4%; (6) A dummy variable that is equal to 1 if individuals expect a strong increase in inflation in the next 12 months and zero otherwise. It is constructed from the qualitative indicator. (7) Inflation uncertainty. The main explanatory variable is the 7-day incidence, which captures COVID-19 severity at district level on the day of the interview. Other explanatory variables include: the unemployment rate in the district, the stringency index, the subjective assessment about the severity of the pandemic and the impact on the economy, age, education, income, homeownership, whether she lives in an urban area. Significance levels are reported as follows: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

In the case of other individual control variables related to the socio-economic factors, the results match those observed in earlier studies (Ehrmann et al., 2017; Goldfayn-Frank & Wohlfart, 2020; Souleles, 2004). In the regression we add three dummies for households belonging to income groups less than 2,500 EUR, between 2,500 and 4,000 EUR, and more than 4,000 EUR per month. The results show that the higher the income group the household belongs to, the lower the expected inflation rate over the next 12 months.

When it comes to the households' qualitative measure of inflation expectations (column 6), we find no effect of the 7-day incidence. This results might be partially explained by the results in Figure C1, which shows how the share of individuals that expect inflation to *strongly decrease, decrease, stay the same, increase or strongly increase* changed over time. When it comes to inflation, a large share of individuals, even in normal times, believe the inflation rate will increase. Therefore, this measure might not be the best to capture the within-individual changes. The quantitative measure on the other hand, can capture information on the magnitude of expected change even if the household expects inflation to increase both before and during the COVID-19 pandemic.

In terms of inflation uncertainty, the results in column (7) show that regional COVID-19 exposure does play a role, however the effect is less strong than for average inflation expectations. What matters for inflation uncertainty according to our results are: the stringency of containment measures in the district and the expected duration of COVID-19 restrictions. The stricter the regional lockdown measures and the longer the respondent thinks these restrictions will last, the higher the inflation uncertainty. As expected, higher income, and older and more educated respondents exhibit lower inflation uncertainty (Ehrmann et al., 2017).

3.2. The role of the regional economy

It is well documented that the pandemic impact was very heterogeneous even within-country. For instance, Meinen, Serafini, and Papagalli (2021) discuss how the economic impact across regions is attributed not only to the spread of infections, but also depends heavily on the regions' structural composition. In this context, we want to study whether COVID-19 severity

has the same impact among regions that were more or less severely impacted in terms of economic development. Our hypothesis is that although the pandemic itself causes a lot of uncertainty and economic fear, the starkness of the response should be weakened by a strong economy that can easily adjust and withstand the shock that COVID-19 poses to economic agents and society. The following analysis answers the question: does the 7-day incidence more severely influence inflation expectations of consumers that live in districts with higher unemployment rates?

To explore this additional regional heterogeneity we add an interaction term to specification 1 and estimate the following model:

$$\begin{aligned} Y_{ijt} =& \beta_1 7\text{DayInc}_{ijt} + \beta_2 \text{D.HighUnempl}_{jt} + \beta_3 7\text{DayInc}_{ijt} * \text{D.HighUnempl}_{jt} \\ &+ \beta_4 \text{Individual}_{it} + \delta \text{Regional}_{jt} + \epsilon_{ijt} \end{aligned} \tag{2}$$

The variables in the specification remain similar to the ones explained in equation 1 with the exception of the interaction term between the 7-day incidence and the regional unemployment variable. We use the unemployment rate in the district *before* the pandemic to classify the regions into two groups for high (above the average unemployment rate) versus low (below the average unemployment rate) unemployment regions. This variable remains constant before and after the pandemic outbreak in order to capture pre-pandemic vulnerabilities. Therefore to use the variation that arises from the between-region heterogeneity we employ a random effects model instead of a fixed effects model. The main coefficient of interest is β_3 the interaction term, which captures differences in the relation between the 7-day incidence and expected inflation between regions of high versus low unemployment before the pandemic. As can be seen in the first column of Table 3 the coefficient for the interaction term is positive and statistically significant at the 5-percent level. It shows that the effect of local COVID-19 exposure on inflation expectations is stronger for individuals living in regions with higher unemployment rates before the pandemic outbreak. However, the interaction effect is not significant for the probabilistic measures or for inflation uncertainty.

To ease the interpretation, we graphically illustrate the results in Figure 2, which plots the

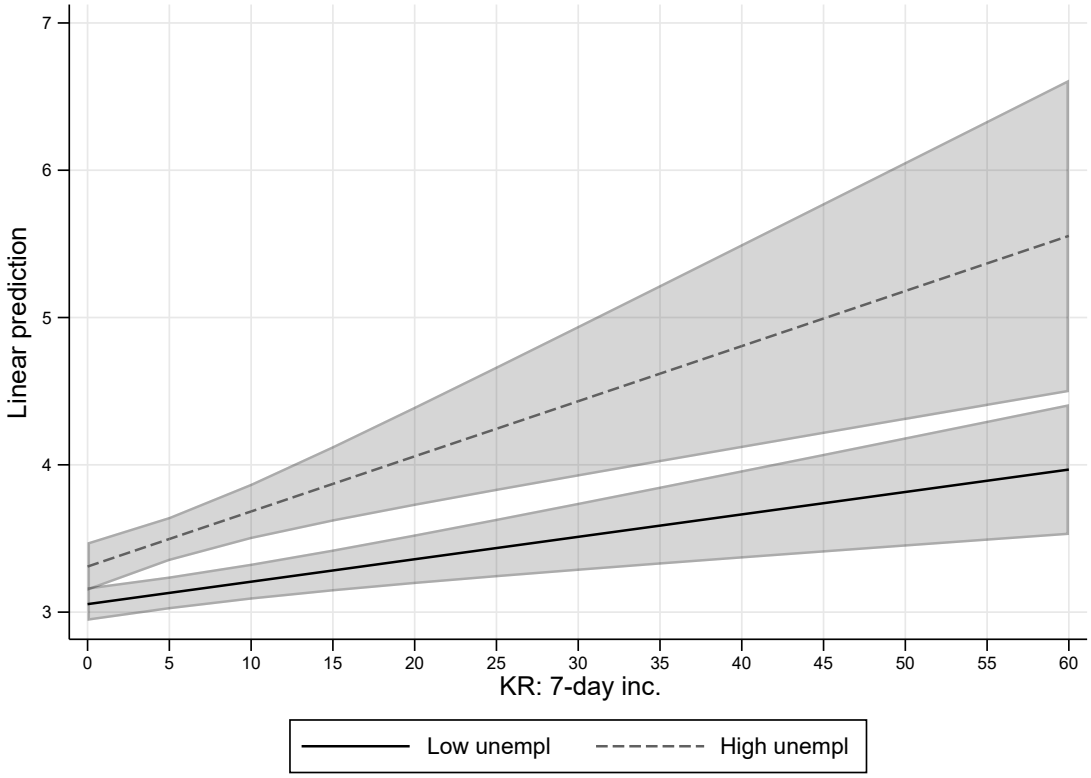
Table 3: The influence of local economic conditions on inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	E. Inflation	Pr (<0)	Pr (0 - 2)	Pr (2 - 4)	Pr (>4)	Strong Incr.	Uncertanty
7-day inc.	0.02***	-0.02	-0.09***	0.002	0.1***	0.001***	0.002
	(0.003)	(0.03)	(0.03)	(0.03)	(0.03)	(0.0003)	(0.002)
High unempl	0.3**	0.2	-1.5*	-0.3	1.6**	0.02*	0.1**
	(0.1)	(0.7)	(0.9)	(0.7)	(0.8)	(0.009)	(0.05)
High unempl × 7-day inc.	0.02***	0.03	-0.01	-0.09	0.08	0.00006	0.003
	(0.009)	(0.07)	(0.08)	(0.07)	(0.07)	(0.0008)	(0.005)
Stringency index	-0.0007	0.1***	-0.3***	0.06	0.08**	0.003***	0.03***
	(0.006)	(0.04)	(0.05)	(0.04)	(0.04)	(0.0005)	(0.003)
Exp. restrictions	0.001	0.1**	-0.2***	-0.1*	0.2***	0.003***	0.02***
	(0.009)	(0.06)	(0.08)	(0.07)	(0.07)	(0.0008)	(0.004)
Economy a problem	0.3***	-0.2	-1.6***	-0.4*	2.1***	0.04***	0.03**
	(0.03)	(0.2)	(0.2)	(0.2)	(0.2)	(0.002)	(0.01)
Observations	12562	10249	10249	10249	10249	12864	9840
Adj. R^2	0.05	0.04	0.07	0.01	0.07	0.07	0.06
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the results of a random effects regression model with robust standard errors clustered at district level. Year fixed effects are included. The period of analysis includes April to June 2019 (pre-pandemic period) and April to July 2020 (first wave of the COVID-19 pandemic). The dependent variables for each column are the following: (1) Expected inflation measured as a point prediction; (2) Probability of expecting inflation realizations that are less than zero; (3) Probability of expecting inflation between 2% and 4%; (4) Probability of expecting the inflation rate to fall between 2% and 4%; (5) Probability of expecting the inflation rate to be more than 4%; (6) A dummy variable that is equal to 1 if individuals expect a strong increase in inflation in the next 12 months and zero otherwise. It is constructed from the qualitative indicator. (7) Inflation uncertainty. The main explanatory variable is the 7-day incidence, which captures COVID-19 severity at district level on the day of the interview. "High unempl" is an indicator variable that is equal to 1 if a region experienced high unemployment rate before the pandemic (i.e. unemployment rates higher than 4.9%) and zero otherwise. Other explanatory variables include: the containment measure stringency index, the subjective assessment of how individuals consider the pandemic a sever problem in terms of the pandemic and the economy, age, education, income, homeownership, whether she lives in an urban area. Significance levels are reported as follows: * p<0.10, ** p<0.05, *** p<0.01.

predictive margins for inflation expectations against a given level of exposure to COVID-19 split between regions with a low and high unemployment rate prior to the pandemic outbreak. From Figure 2, three aspects are worth noting. First, for both unemployment groups, the relationship between the 7-day incidence and the expected inflation rate is positive. Second, the level of expected inflation is higher for regions that experienced higher unemployment and it holds true at any level of the virus incidence. Third, the divergence between the two groups increases over the reported number of COVID-19 cases in the district. For instance, for the districts where the 7-day incidence was 5 for 100,000 inhabitants and which experienced a low unemployment rate, the expected inflation rate was slightly above 3%. By contrast, districts that experienced the same incidence but higher unemployment rates had an expected inflation rate of around 3.4%. This difference is larger in the case of a 7-day incidence of 55 per 100,000 inhabitants; for each of the unemployment groups, low and high, the inflation rate is approximately 3.9% vs 5.4%, respectively. Overall, these results imply that economic conditions in the region make the relation between the 7-day incidence and the inflation rate more sensitive. One interpretation of these results is that consumers take into consideration the economic conditions in the district when considering whether the pandemic will lead to high or low inflation as a result of higher COVID-19 cases. Knowledge of existing vulnerabilities in the local economy, amplifies the economic fears created by the spread of the virus.

Figure 2. Predictive margins for inflation expectations in high and low unemployment districts



Notes: The plot shows the predicted values for inflation expectations. The predicted values for the expected inflation rate are shown in the y-axis, while the x-axis shows the values of the 7-day incidence. The shaded area indicates the 95% confidence intervals. A region is classified as a "high unemployment region" if the unemployment rate is above the mean of 4.9% before the pandemic outbreak and it is considered as a "low unemployment region" otherwise.

4. The Role of Information During the COVID-19 Pandemic

We have shown in the previous section that the spread of the coronavirus led to substantial heterogeneity in consumer inflation expectations and that this relationship is amplified by local economic conditions. We now turn to the channel through which local exposure to COVID-19 cases feeds into consumers' expectations about the macroeconomy. We initially explore the role that **information** plays in the expectation formation process during the early phases of the pandemic.

The COVID-19 pandemic was unique compared to other types of crises. Public health aware-

ness and information regarding the progression of the pandemic was seen as an important tool to contain and slow down the spread of the virus. The general public was informed on a daily basis about the latest coronavirus numbers at national and local level and the public attention to the news was also very high. In Germany, the main reporting agency, the RKI, was publishing daily data about the new confirmed cases at district level. COVID-19 related news received wide coverage on traditional and social media as well. Consequently, the public was constantly exposed to the latest information on the progression of the pandemic. Hence, we argue that the 7-day incidence and the unemployment rate in the district captures news and information that individuals are exposed to and in turn, this information feeds into their subjective process of expectation formation.

To establish that this was actually the case and there is an information component to individuals' expectation formation, two conditions need to be satisfied: 1) individuals need to be aware of the news related to the pandemic and its effects on the economy; 2) they need to show a good understanding of the information, i.e. what they know should be correlated to what the actual official figures show.[15]

4.1. Do individuals follow the news related to the COVID-19 pandemic?

We start by showing that the first condition is fulfilled. To check whether consumers really took notice of the news around the pandemic, we use the following question from the BOP-HH, in April 2020:

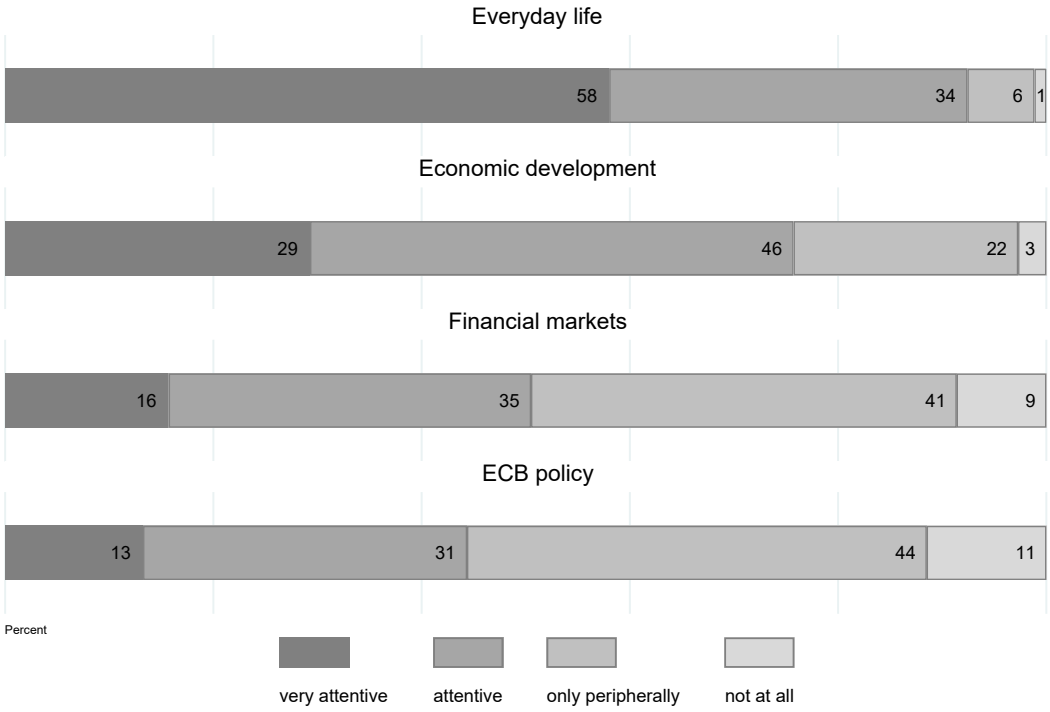
News about COVID-19: *"How closely do you follow the news on the coronavirus pandemic?" News on: a) the impact on everyday life; b) the impact on economic growth; c) the impact on the financial markets; d) monetary policy measures of the European Central Bank (ECB).*

The respondent could answer for each category as '*following the news*': 1) very closely, 2) closely, 3) rarely, 4) not at all. Figure 3 shows that out of 2,033 respondents, 58% follow the

[15] Of course, we are not claiming that everyone pays the same attention and interprets the facts the same way. The results we will report subsequently in section 4.1 will describe the different attentiveness level to news. We will elaborate more on the subjectiveness of interpreting the news about the coronavirus and the economy later on in section 5, where we will also address the importance of personal experience during the pandemic.

news on the coronavirus related to everyday life very attentively and 34% attentively. Overall, we can see that approximately 92% of respondents are closely paying attention to news about the coronavirus pandemic. The share of respondents who follow the news very attentively or attentively decreases with the complexity of the topic: 75% of respondents follow the news very attentively or attentively for economic development, 51% for financial markets and 44% for monetary policy measures of the ECB. The overall response to this question supports the idea that attention to news about the pandemic and its potential impact on the economy was quite high during the early stages of the virus outbreak.

Figure 3. Consumers' attention to news about the COVID-19 pandemic



Notes: The figure shows the answer of respondents to the question: *"How closely do you follow the news on the coronavirus pandemic?" News on: a) the impact on everyday life; b) the impact on economic growth; c) the impact on the financial markets; d) monetary policy measures of the European Central Bank (ECB).* Each horizontal bar reports the percentage of respondents for each category that answers as following the news 1) very closely, 2) closely, 3) rarely, 4) not at all. The total number of respondents was 2,033. The question is part of the BOP-HH questionnaire fielded in April 2020.

4.2. *Do individuals have a good understanding of the impact the pandemic has at the district level?*

Next, we show that the majority of BOP-HH respondents not only follow the news related to the pandemic, but also have a good understanding of how their district is affected. To make a clear link between the coronavirus infectiousness and the information that households actually know about it, we asked BOP-HH respondents in November 2020 and in May 2021 a question related to their perception concerning the coronavarius progression and impact *in the district* where they lived. The question was formulated as follows:

Individuals' subjective perception about the impact of COVID-19: *"What would you say: How strongly was the district where you live affected by the coronavirus pandemic overall?*
1) In terms of COVID-19 cases
2) In terms of the economic situation"

The respondents could answer on a scale from zero (not affected at all) to ten (strongly affected) for each of the two categories separately. The goal of this question is to capture each individual's subjective assessment of the pandemic severity in their district. We aim to distinguish between respondents that associate the severity of the pandemic impact with its 1) *spread* versus 2) *economic* impact in the district of residence.

Figure 4 shows the relationship between respondents' perception and the actual data. On the horizontal axis we plot the possible answer categories for each question.[16] The length of the bar in panels (a) and (c) shows the mean value for the cumulative number of coronavirus cases experienced in the region in November 2020 and May 2021, respectively, while in panels (b) and (d) the length of the bar indicates the average unemployment rate experienced in the region in November 2020 and May 2021.

In panels (a) and (c) people that report being severely hit by the pandemic in terms of coronavirus numbers (answer category ten) experienced on average a total of 1,609 cases per 100,000

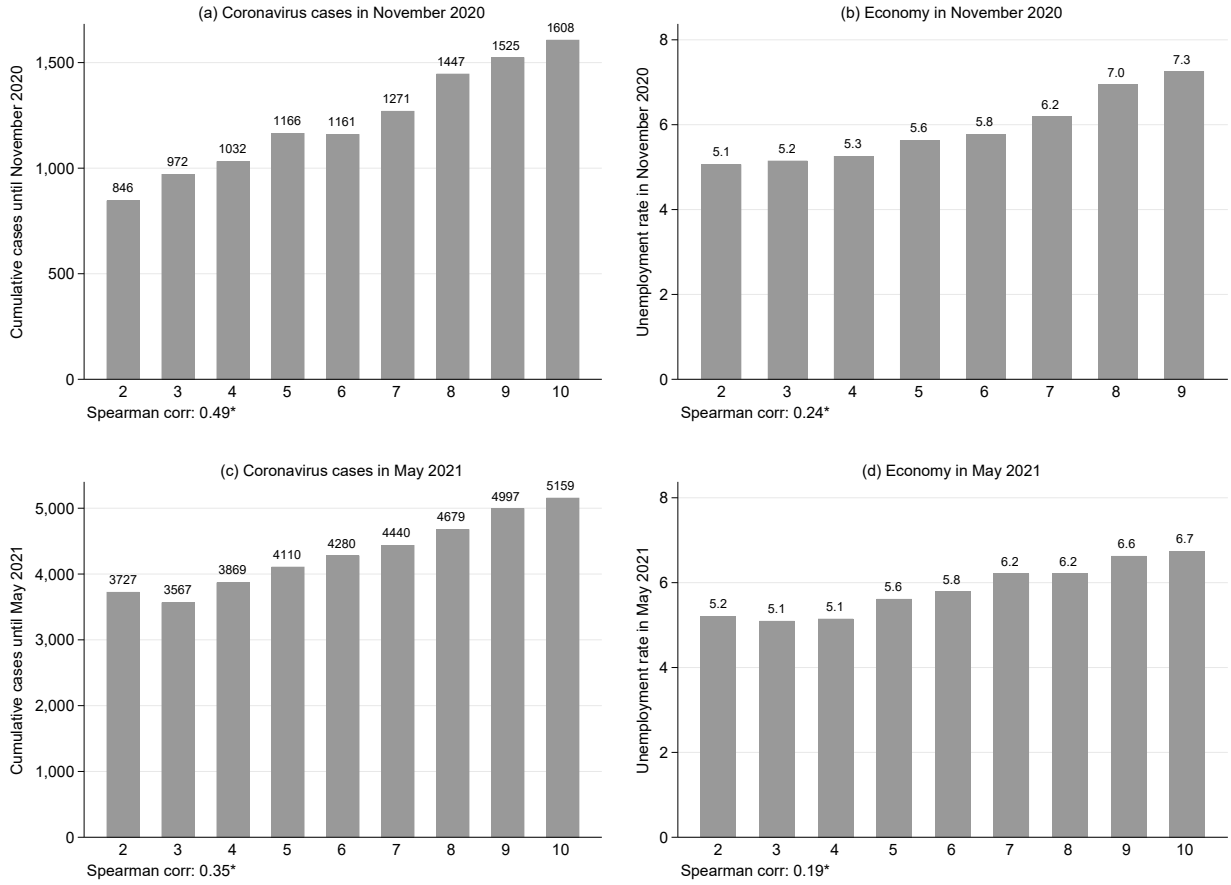
[16]For the graph in panel (a) we group the response categories 0 to 2 together into only one category because of the small number of respondents. We do the same for the graph in panel (b) for the lower categories and for the upper categories 9 and 10, and for the graphs in panels (c) and (d) for the lower categories.

inhabitants in the district where they live from the start of the pandemic until November 2020 and 5,159 cases per 100,000 inhabitants until May 2021. By contrast, individuals reporting that they have been hit mildly or not at all (less than two) experienced only 847 cases per 100,000 inhabitants until November 2020. The same interpretation applies to panel (c). People that report being hit severely (9 or 10) by the pandemic in terms of the economy in the district where they live experienced an average unemployment rate of 7.3% in November 2020, while those reporting being hit mildly or not at all (2 or lower) experienced in reality an unemployment rate of 5.1% on average. The same interpretation applies to panel (d) for May 2021. The relation between actual coronavirus numbers and households' perceived severity is stronger in November 2020 than in May 2021. Taken together, the findings from Figure 3 and Figure 4 indicate that households pay attention to the news related to coronavirus developments and have a good understanding of the situation in terms of the progression and impact of the pandemic in the district where they reside.

However, there is one aspect that emerges from the findings regarding individuals' perception of about the *economic situation*. From Figure 4 we can see that the correlation is weaker for unemployment (panels b and d) than for coronavirus cases (panels a and c), which is consistent with the previous findings in Figure 3 where we show that people pay more attention to news related to coronavirus in their everyday life than to news related to the economic development during the pandemic period.[17] A lower correlation between the official unemployment numbers and the perceived severity in terms of economic impact in the district could indicate that the latter, i.e. the "subjective assessment" of the situation in the district is an important driver of consumers' expectation formation process which should be taken into account. Additionally, the respondents' individual-level experience during COVID-19 could be an important factor to consider. Therefore, in the next section, we move on to a regression analysis where we take into account both i) the *local experience* effect during the pandemic, which we capture through the *subjective perceived severity of COVID-19 on the local economy*, and ii) *personal experience* during the pandemic, i.e. personal financial losses experienced during the pandemic.

[17] In Figure F1 of Appendix F we illustrate that there is substantial heterogeneity in the perceived severity even for the same level of exposure and information.

Figure 4. Correlation between perceptions of consumers and the actual data



Individuals' subjective perception about the impact of the pandemic

Notes: The figure shows the relationship between respondents' perception and the actual data related to COVID-19 and the unemployment rate in the district. Panels (a) and (b) report the results for November 2020 and panels (c) and (d) for May 2021. The possible answer categories for the following two questions are plotted along the horizontal axis: *"What would you say: How strongly was the district where you live affected by the coronavirus pandemic overall? 1) In terms of COVID-19 cases 2) In terms of the economic situation"*. Respondents could answer on a scale from zero (not affected at all) to ten (strongly affected) for each of the two questions separately. For May 2021 the answer categories vary from one to ten. The vertical bar reports the average number of COVID-19 cases (panels (a) and (c)) and unemployment rate (panels (b) and (d)) experienced by the group of respondents in each of the categories. Below each panel the Spearman's rank correlation coefficient is reported, in each case at the 1% significance level.

5. The Role of Perceptions about the Economic Impact of the Pandemic

We showed in the previous section that attention to news during the pandemic was high during the first phase of the outbreak. Likewise, we explained that there is high heterogeneity in how people interpret and perceive even the same official statistics. Therefore, an additional channel that should be taken into account when explaining people's heterogeneous expectations is the role of experience effects. We include in a regression framework two questions that capture individuals' local and individual-level experience effects (Malmendier, 2021; Malmendier & Shen, 2018). To capture the former, i.e. the local experience effect during the pandemic, we use the following question:

Individuals' perception about the impact of COVID-19 on the local economy: *"What would you say: How strongly was the district where you live affected by the coronavirus pandemic in terms of the economic situation?"*

To take into account the individual-level experience during the pandemic we consider the following question:

Individuals' personal experience during COVID-19: *"Overall, how strongly was your household financially affected by the coronavirus pandemic?"*

Table 4 shows the results from the cross-sectional analysis for inflation expectations. In panel A we report the results for November 2020 and in panel B for May 2021. The variable that captures individuals' perception about the local impact of COVID-19 on the local economy ("Corona impact-economy") is included as an ordinal variable that ranges from zero to ten for November 2020 and from one to ten for May 2021.[18] The results show that the stronger the perceived impact of COVID-19 on the local economy, the higher inflation expectations are (column 1) and the higher the probability to expect inflation above 4% is (column 4). An increase in the perceived severity by one unit increases inflation expectations by approximately

[18] We use a cross-sectional framework because the questions on perceptions were only included in November 2020 and May 2021.

0.1 percentage points on average in both November 2020 and May 2021.

Personal experience matters in forming future predictions about inflation as well. Our results for both November 2020 and May 2021 indicate that consumers who say their household was strongly affected financially by the pandemic report higher inflation expectations and uncertainty on average. The effect is stronger and becomes more pronounced in May 2021 than November 2020, indicating that personally experienced losses may linger on and become more of a burden as the pandemic progresses. We also include a set of regional-level controls (not reported in Table 4) to account for the differences in district characteristics prior to the pandemic; they are all statistically not significant. As for respondents' characteristics, which are also not reported, women, individuals with lower education, and income, and those who lived in the GDR prior to 1989 have higher inflation expectations on average.

Table 4: The effect of local and individual-level experience on inflation expectations

	(1) E. Inflation	(2) Pr (<0)	(3) Pr (0 - 2)	(4) Pr (2 - 4)	(5) Pr (>4)	(6) Strong Incr.	(7) Uncertanty
Panel A: November 2020							
Corona impact - economy	0.126***	-0.226	-1.286**	0.201	1.312***	0.022***	-0.048*
	(0.05)	(0.39)	(0.52)	(0.41)	(0.35)	(0.00)	(0.03)
Corona individual impact	0.092**	0.565**	-0.991***	-0.558*	0.984***	0.011***	0.064***
	(0.04)	(0.28)	(0.32)	(0.29)	(0.31)	(0.00)	(0.02)
7-day inc.	-0.002*	0.000	-0.001	0.000	0.001	-0.000	-0.001
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
Unempl. (monthly)	-0.028	-0.384	0.771	0.455	-0.842**	-0.002	0.044
	(0.05)	(0.41)	(0.54)	(0.47)	(0.39)	(0.00)	(0.03)
Stringency index	-0.007	0.145	0.077	0.176	-0.399**	-0.001	-0.011
	(0.02)	(0.21)	(0.24)	(0.19)	(0.17)	(0.00)	(0.01)
Observations	1742	1659	1659	1659	1659	1781	1659
R^2	0.09	0.01	0.07	0.01	0.11	0.06	0.05
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: May 2021							
Corona impact - economy	0.107***	-0.190	-0.476*	-0.228	0.893***	0.021***	0.024
	(0.03)	(0.18)	(0.28)	(0.31)	(0.23)	(0.00)	(0.02)
Corona individual impact	0.234***	0.213	-1.992***	-0.554**	2.332***	0.025***	0.064***
	(0.03)	(0.16)	(0.24)	(0.23)	(0.25)	(0.00)	(0.02)
7-day inc.	-0.000	0.009	-0.039**	0.022	0.008	0.000	-0.000
	(0.00)	(0.01)	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)
Unempl. (monthly)	0.016	-0.213	0.850***	-0.388	-0.249	-0.001	-0.014
	(0.03)	(0.16)	(0.28)	(0.29)	(0.28)	(0.00)	(0.02)
Stringency index	0.002	-0.012	-0.046	0.058	-0.001	0.000	-0.004**
	(0.00)	(0.02)	(0.03)	(0.04)	(0.03)	(0.00)	(0.00)
Observations	5153	4613	4613	4613	4613	5227	4613
R^2	0.11	0.01	0.06	0.03	0.09	0.04	0.04
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the results of an OLS regression with robust standard errors clustered at district level. The period of analysis includes two waves of the survey. The results for November 2020 are reported in Panel A and those for May 2021 are reported in Panel B. The dependent variables for each column are the following: 1) Expected inflation measured as a point prediction; (2) Probability of expecting inflation realizations that are less than zero; (3) Probability of expecting inflation between 2% and 4%; (4) Probability of expecting the inflation rate to fall between 2% and 4%; (5) Probability of expecting the inflation rate to be more than 4%; (6) A dummy variable that is equal to 1 if individuals expect a strong increase in inflation in the next 12 months and zero otherwise. It is constructed from the qualitative indicator. (7) Inflation uncertainty. The main explanatory variables are: i) Corona impact - economy, which measures individuals' perception about the impact of COVID-19 on the local economy; ii) Corona individual impact, which captures individuals' personal experience during COVID-19; iii) 7-day inc: the 7-day incidence in the district. Other explanatory variables include: the stringency index, the unemployment rate in the district, age, gender, education, income, homeownership, and whether she lives in an urban area, whether the respondent was living in the former German Democratic Republic before the fall of the Berlin Wall. It also includes a set of regional controls: the share of employees in the knowledge-intensive industries, overnight stays by guests in accommodation establishments, share of employees in the service sector, and the share of employees with an academic degree. Significance levels are reported as follows: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

6. Households' view: COVID-19 as a Supply-Side Shock

The results until this point indicate that consumers associate the severe impact of the pandemic with higher inflation expectations, which overall suggests that consumers tend to have a supply-side view of the shock. To provide further evidence on people's view about inflation dynamics in the face of COVID-19 pandemic, in this section we rely on other macroeconomic expectations variables asked in BOP-HH during the first phase of the pandemic and later on in November 2020 and May 2021.

First, we run a similar regression to the one reported in Table 2 for inflation. The variables of interest in this case are the expectations of households about economic growth, unemployment, interest rates, house prices and rents. During the first wave of the pandemic, these variables were mainly asked as a qualitative question. The results in Table 5 indicate that the regional heterogeneity in terms of the 7-day incidence does not matter for unemployment, interest rates or rent expectations. However, the year indicator ("Year Dummy (2020)") is statistically significant, indicating that the pandemic outbreak as an overall shock negatively influenced unemployment rate expectations, house prices and rents. We find that the higher the stringency of containment measures, the less optimistic consumers are about unemployment rate, credit interest rates, house prices and rents. In addition, the more respondents think the coronavirus pandemic is a serious problem and the longer they expect the restrictions to last, the higher the expected unemployment rate is.

Second, to check how much individual subjective experience is driving expectations with regard to other components such as GDP growth, unemployment, income growth and intention to consume and save in the future, we rely again on the November 2020 and May 2021 waves of BOP-HH. In Table 6 we report the results on households' expectations about GDP growth, which is measured in column (1) in the form of a probabilistic question and in column (2) as a dummy variable.[19] The results indicate that the higher the perceived impact of COVID-19 on local economic activity (*"Corona impact - economy"*), the lower the expected GDP growth in the next 12 months (columns (1) and (2)). Another important factor driving GDP growth

[19]The GDP growth derived from the probabilistic question is available only in November 2020.

Table 5: The effect of the 7-day incidence on other macroeconomic expectations

	(1)	(2)	(3)	(4)	(5)
	D. Incr Unempl	D. Incr Creditint	D. Incr Savingint	D. Incr House Prices	D. Incr Rents
7-day inc.	-0.0004	-0.00005	-0.0001	-0.0001	0.00010
	(0.0003)	(0.0005)	(0.0002)	(0.001)	(0.0008)
Unempl. (monthly)	0.004	0.03	-0.01	0.01	0.01
	(0.02)	(0.02)	(0.01)	(0.03)	(0.03)
Stringency index	0.001*	0.002*	0.0009	-0.005***	-0.003**
	(0.0008)	(0.001)	(0.0006)	(0.001)	(0.001)
Exp. restrictions	0.004***	-0.001	-0.0007	0.002	0.002
	(0.001)	(0.002)	(0.0008)	(0.002)	(0.002)
Coronavirus a problem	0.01**	-0.008*	-0.003*	-0.002	-0.008*
	(0.004)	(0.005)	(0.002)	(0.005)	(0.004)
Economy a problem	-0.0008	0.001	-0.0004	0.003	0.003
	(0.004)	(0.006)	(0.002)	(0.005)	(0.004)
Age	0.005	-0.03	-0.009	0.09***	0.07***
	(0.02)	(0.02)	(0.009)	(0.02)	(0.02)
With college degree	-0.05	0.03	-0.0005	0.1**	0.08
	(0.05)	(0.06)	(0.04)	(0.05)	(0.05)
Inc.: EUR 2500 - EUR 4000	0.005	-0.05*	-0.02	-0.03	-0.02
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
Inc.: more EUR 4000	0.004	-0.05	-0.02	-0.03	0.02
	(0.04)	(0.04)	(0.02)	(0.04)	(0.04)
Owner	-0.05	0.05	0.04	-0.1***	-0.05
	(0.05)	(0.06)	(0.04)	(0.06)	(0.06)
Urban	-0.5***	-0.6	-0.04***	-0.4***	-0.9***
	(0.02)	(0.4)	(0.01)	(0.03)	(0.3)
Year Dummy (2020)	0.3***	-0.09	-0.02	-0.3***	-0.3***
	(0.07)	(0.08)	(0.04)	(0.09)	(0.08)
Observations	13875	13862	13862	13870	13868
Adj. R^2	0.2	0.005	0.008	0.1	0.1
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the results of a fixed effects regression model with robust standard errors clustered at district level. It includes individual and year fixed effects. The period of analysis includes April to June 2019 (pre-pandemic period) and April to July 2020 (first wave of the COVID-19 pandemic). The dependent variables for each column are the following: (1) Dummy equal to one if the respondent expects an increase in the unemployment rate; (2) Dummy equal to one if the respondent expects an increase in the credit interest rate; (3) Dummy equal to one if the respondent expects an increase in the saving interest rate; (4) Dummy equal to one if the respondent expects an increase in house prices; (5) Dummy equal to one if the respondent expects an increase in rents. The main explanatory variable is the 7-day incidence, which captures COVID-19 severity at district level on the day of the interview. Other explanatory variables include: the unemployment rate in the district, the containment measure stringency index, the subjective assessment of how individuals consider the pandemic a severe problem in terms of the pandemic and the economy, age, education, income, homeownership, whether she lives in an urban area. Significance levels are reported as follows: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

expectations is the effect that the coronavirus pandemic had on the financial situation of the households. The more the households report being affected in terms of their financial situation (*"Corona individual impact"*) the more pessimistic their expectations are in terms of the economic growth in the future. Regarding the expected change in household income, what matters in terms of the coronavirus impact is households' perception of the severity of the coronavirus for the local economy and the impact that the coronavirus had on their household income in the past. An increase in the respondents' perception of the severity by one decreases their expected income in the next 12 months by 27 EUR on average. By contrast, if the individual household impact due to the coronavirus increases by one on a scale from zero to ten, the expected decrease in income is on average 51 EUR. The perceptions of the impact of the coronavirus on the local economy do not influence the expectations on interest rates. However, respondents that have been individually impacted by the pandemic expect higher credit interest rates on average.

Regarding spending and saving behavior (columns 6 and 7), again perceptions about the local economy and the individual household impact of the pandemic both play an important role. Households that perceive that their local economy has been hit hard by the pandemic report that they intend to make fewer major purchases and save more in the future, while households that report being personally negatively impacted by the pandemic say they intend to make fewer major purchases and save less in the future. Overall the results remain similar in magnitude and significance for all the variables in May 2021, except for saving intentions. The different effect for saving intentions can be explained as follows. During the early stages of the pandemic, households that were been personally affected by the pandemic had no choice and adjusted in the short term by saving less. Later on, in May 2021, having overcome the first impact, households reported intending to save more potentially due to precautionary motives and uncertainty in the future. An additional explanation is that households experienced more lockdown measures in November 2020 than May 2021. The COVID-19 situation was slightly improving in May 2021 and individuals may have started spending more on holidays.

Overall, the results indicate that households view the pandemic mainly as a supply side shock and they expect higher inflation and higher unemployment in the future. The finding

Table 6: The effect of local and individual-level experience on other macroeconomic expectations and the intention to save

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exp.GDP	D. Incr Growth	E.inc. growth	D. Incr Unempl	D. Incr Creditint	Purchase less	Save more
Panel A: November 2020							
Corona impact - economy	-0.137***	-0.009	-23.490***	0.022***	0.002	0.014**	0.009*
	(0.05)	(0.01)	(7.84)	(0.01)	(0.01)	(0.01)	(0.00)
Corona individual impact	-0.093**	-0.010**	-50.895***	0.005	0.013***	0.041***	-0.010***
	(0.04)	(0.00)	(6.79)	(0.00)	(0.00)	(0.00)	(0.00)
7-day inc.	0.001	0.000	0.384**	-0.000	0.000	0.000	0.000
	(0.00)	(0.00)	(0.18)	(0.00)	(0.00)	(0.00)	(0.00)
Unempl. (monthly)	0.094*	0.004	9.877	-0.000	-0.000	-0.003	0.003
	(0.05)	(0.01)	(6.84)	(0.01)	(0.01)	(0.01)	(0.01)
Stringency index	0.033	-0.000	1.060	-0.001	0.000	0.001	0.002
	(0.02)	(0.00)	(2.80)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	1704	1782	1732	1782	1781	1781	1779
R^2	0.07	0.06	0.10	0.02	0.06	0.10	0.03
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: May 2021							
Corona impact - economy	-0.009**	-0.009**	-7.637*	0.017***	0.003	0.001	-0.005*
	(0.00)	(0.00)	(4.39)	(0.00)	(0.00)	(0.00)	(0.00)
Corona individual impact	-0.025***	-0.025***	-46.755***	0.027***	0.015***	0.015***	0.010***
	(0.00)	(0.00)	(5.08)	(0.00)	(0.00)	(0.00)	(0.00)
7-day inc.	-0.000	-0.000	-0.356	0.000	-0.000	-0.000	0.000
	(0.00)	(0.00)	(0.38)	(0.00)	(0.00)	(0.00)	(0.00)
Unempl. (monthly)	-0.001	-0.001	5.676	0.002	0.002	0.000	-0.000
	(0.00)	(0.00)	(5.31)	(0.00)	(0.00)	(0.00)	(0.00)
Stringency index	-0.000	-0.000	0.123	0.001*	0.001	-0.000	-0.000
	(0.00)	(0.00)	(0.84)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	5228	5228	3580	5231	5226	5219	5214
R^2	0.08	0.08	0.05	0.05	0.02	0.03	0.03
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the effect of local and personal-level experience on other macroeconomic expectations and the intention to spend or save. It reports the results of OLS regression with robust standard errors clustered at district level. The period of analysis includes two waves of the survey. The results for November 2020 are reported in Panel A and those for May 2021 are reported in Panel B. The dependent variables for each column are the following: (1) Dummy equal to one if the respondent expects an increase in the unemployment rate; (2) Dummy equal to one if the respondent expects an increase in the credit interest rate; (3) Dummy equal to one if the respondent expects an increase in the saving interest rate; (4) Dummy equal to one if the respondent expects an increase in house prices; (5) Dummy equal to one if the respondent expects an increase in rents. The main explanatory variables are: i) Corona impact - economy, which measures individuals' perception about the impact of COVID-19 on the local economy; ii) Corona individual impact, which captures individuals' personal experience during COVID-19; iii) KR: 7-day inc. Other explanatory variables include: the containment measure stringency index, the unemployment rate in the district, age, education, income, homeownership, and whether she lives in an urban area. Significance levels are reported as follows: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

that consumers associate bad economic outcomes with higher inflation is not new (Andre, Haaland, Roth, & Wohlfart, 2021; Binder, 2020; Candia et al., 2020; Kamdar, 2019). Andre et al. (2021) conduct an extensive study on households narratives about inflation dynamics. The authors find that households mainly focus and name supply side factors as the driving forces behind high inflation. Other studies have also reported similar outcomes. Binder (2020), Candia et al. (2020) and Kamdar (2019) argue that consumers beliefs are driven by sentiment. Pessimism leads people to always link a bad state of the economy with high inflation, where economic growth is declining and inflation is increasing. Our results corroborate the later statement. Consumers who think the pandemic has severely affected to local economy have overall a more pessimistic view of the economy and their own finances.

7. Conclusions

In this paper we document a large shift in households' inflation expectations and an increase in individual uncertainty and disagreement immediately after the COVID-19 outbreak. We use data from the Bundesbank Online Panel Households (BOP-HH) and fixed effects models to document that higher COVID-19 case numbers in the region where the respondent lives is associated with higher inflation expectations on average. An increase in the 7-day incidence by 50 is associated with an average increase by 0.9 percentage points in household inflation expectations. The economic performance of the district plays an important role in determining how strongly consumers associate the pandemic spread with high inflation expectations.

We argue that the 7-day incidence and unemployment rate in the district captures information that respondents are exposed to. To support this channel, we document that the majority of respondents are aware and follow attentively the news related to the pandemic. However, the importance of information when forming inflation expectations is particularly strong during the first phase of the pandemic, when public attention was high. Later on during the pandemic, we find that despite being exposed to the same news and information, consumers interpret and have different perceptions of how severely the pandemic affected their district. This heterogeneity in households' perceptions of the impact that the COVID-19 outbreak had

in the district matters when forming inflation expectations. We emphasize the importance of considering the perceived severity of the pandemic in terms of *its impact on the local economy*. The perceived severity of the coronavirus in terms of economic conditions is associated with higher inflation expectations. In addition, the results show that households who have worse perceptions of the impact of COVID-19 on the local economy also have more pessimistic views in terms of other macroeconomic expectations: lower economic growth, lower income growth and higher unemployment rate expectations. These respondents are also more likely to report that they plan to spend less on major purchases and save more in the next 12 months. These results hold even when accounting for consumers' personal experience during the pandemic.

The evidence from this paper suggests that disparities which result from the interplay between the local pandemic development and economic conditions, as well as individual experiences during the COVID-19 pandemic, may have longer lasting effects in terms of household beliefs and, consequently, behavior. While Malmendier and Nagel (2011) focus mainly on the effects of experiences of cohorts, we document that at least in the short-run, the impact of a shock on expectations may vary substantially even within cohorts. The extent to which these within-cohort distinct experiences matter later on into the future when the pandemic ends needs to be established in future research.

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A. Summary Statistics: All Variables

Table A1: Summary statistics, April-June 2019 and April-July 2020

	Mean	Median	SD	N
Inflation				
E. Inflation	3.5	2.0	4.6	12585
Infl. uncert.	2.1	1.5	2.1	9780
Pr (Less than 0)	19.2	2.0	28.4	10175
Pr (0,2)	34.7	20.0	33.7	10175
Pr (2,4)	25.6	15.0	28.1	10175
Pr (more than 4)	20.5	5.0	30.0	10175
Infl. uncert.	2.1	1.5	2.1	9780
Other qualitative macroeconomic variables				
Exp. Inflation	3.7	4.0	0.9	12577
Exp. Unemployment	3.7	4.0	1.1	12581
Exp. Credit interest rate	3.3	3.0	0.8	12575
Exp. Saving interest rate	2.5	3.0	0.9	12576
Exp. House prices	3.8	4.0	1.0	12581
Exp. Rents	3.8	4.0	0.8	12579
Socio-demographic characteristics				
Age	47.1	48.0	17.6	12585
Gender	0.5	0.0	0.5	12585
With college degree	0.4	0.0	0.5	12585
Income: less EUR 2500	0.4	0.0	0.5	12585
Income: EUR 2500 - EUR 4000	0.4	0.0	0.5	12585
Income: more EUR 4000	0.3	0.0	0.4	12585
Owner	0.5	1.0	0.5	12585
Urban	0.6	1.0	0.5	12585
East	0.2	0.0	0.4	11185
Subjective perceptions				
Coronavirus a problem	4.6	2.0	3.9	12585
Exp. restrictions	4.4	1.2	5.9	12585
Regional characteristics				
7-day inc.	3.8	0.0	10.1	12585
Stringency index	20.4	26.0	20.9	12585
Exp. restrictions	4.4	1.2	5.9	12585
Unempl. (monthly)	5.7	5.3	2.5	12585
Share service sector	74.1	74.5	10.2	12585
Overnight stays	5.8	3.7	6.3	12508
Knowledge intensive	9.9	8.3	6.9	12585
Share academic	13.0	11.4	5.9	12585

Notes: This table shows the summary statistics for the main variables used in the panel data analysis for the period April-June 2019 and April-July 2020. Results are weighted.

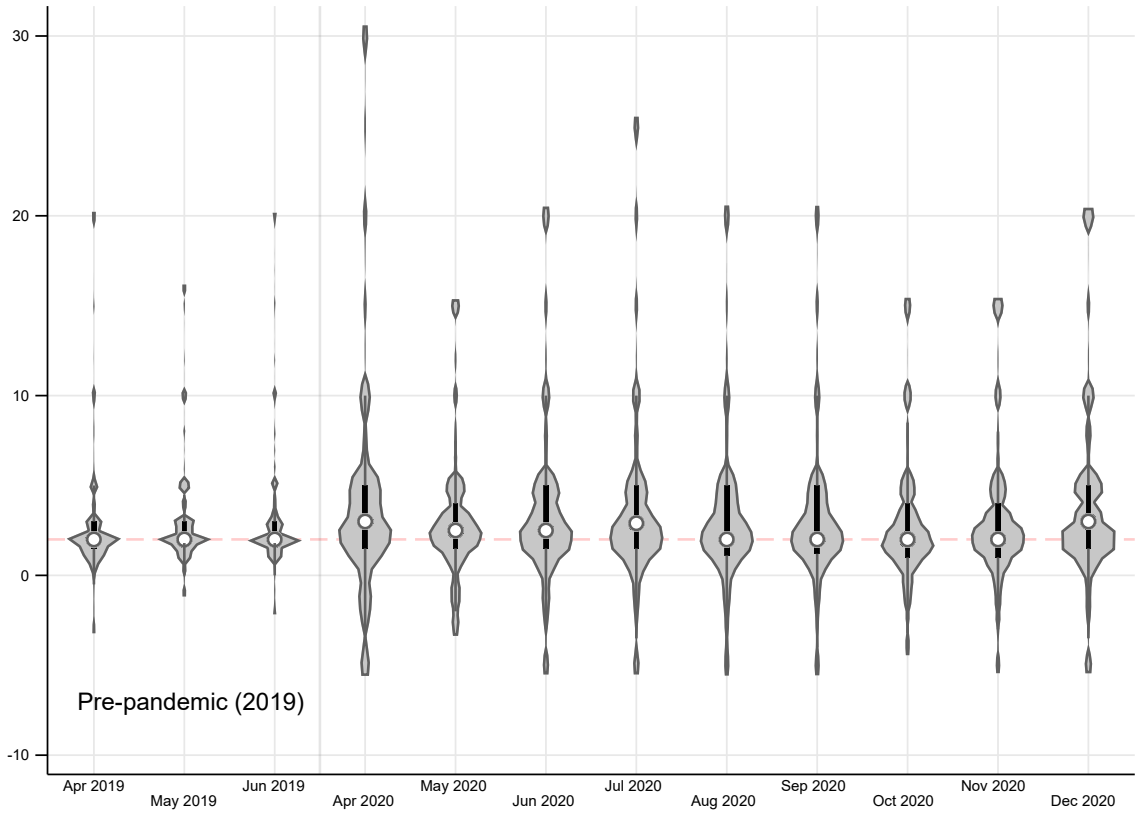
Table A2: Summary statistics, Novemeber 2020 and May 2021.

	Mean	Median	SD	N
Inflation				
E. Inflation	4.1	3.0	4.6	9339
Infl. uncert.	2.0	1.5	2.1	8470
Pr (Less than 0)	15.3	0.0	24.8	8470
Pr (0,2)	30.6	20.0	32.2	8470
Pr (2,4)	31.9	20.0	31.4	8470
Pr (more than 4)	22.2	7.0	31.1	8470
Infl. uncert.	2.0	1.5	2.1	8470
Other qualitative macroeconomic variables				
Exp. Inflation	4.0	4.0	0.8	9524
Exp. Unemployment	3.6	4.0	1.1	9533
Exp. Credit interest rate	3.4	3.0	0.8	9523
Exp. Saving interest rate	2.4	3.0	0.9	9528
Exp. House prices	4.2	4.0	0.9	9532
Exp. Rents	4.0	4.0	0.8	9534
Socio-demographic characteristics				
Age	47.3	49.0	17.2	9540
Gender	0.5	0.0	0.5	9540
With college degree	0.3	0.0	0.5	9536
Income: less EUR 2500	0.3	0.0	0.5	9171
Income: EUR 2500 - EUR 4000	0.3	0.0	0.5	9171
Income: more EUR 4000	0.3	0.0	0.5	9171
Owner	0.6	1.0	0.5	9535
Urban	0.6	1.0	0.5	9540
East	0.2	0.0	0.4	8733
Subjective perceptions				
Exp. restrictions	8.3	6.0	6.1	3492
Corona impact - economy	6.1	6.0	2.0	7996
Corona individual impact	2.9	2.0	2.4	8026
Regional characteristics				
7-day inc.	79.6	63.0	53.2	9536
Stringency index	51.2	51.5	11.1	9540
Unempl. (monthly)	5.9	5.6	2.4	9540
Share service sector	74.0	74.6	10.2	9540
Overnight stays	5.8	3.7	6.3	9487
Knowledge intensive	9.7	8.3	6.6	9540
Share academic	12.9	11.3	5.8	9540

Notes: This table shows the summary statistics for the main variables used in the cross-sectional analysis for the months November 2020 and May 2021. Results are weighted.

B. Summary Statistics: Inflation Expectations Over Time

Figure B1. The distribution of inflation expectations over time

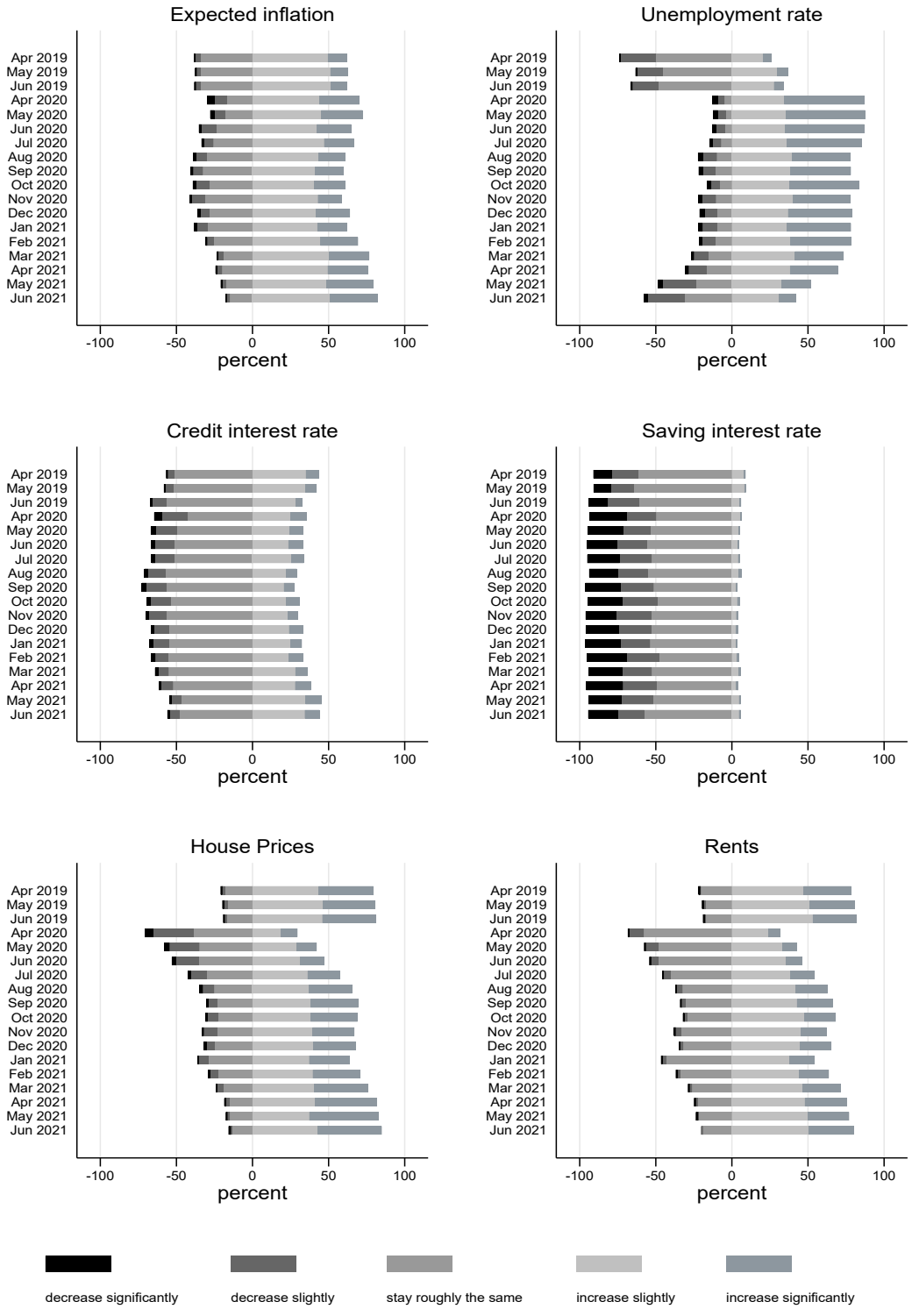


Note: The figure shows violin plots for inflation expectations during each month of the survey period. Inflation expectations are measured as a point forecast and are winsorized at the 1st and 95th percentiles. The pre-pandemic period covers three months: April, May and June 2019. The pandemic period covers months from April to December 2020. Each violin plot contain information on: the median (the white dot), the interquartile range (the black bar in the center of violin), and the lower/upper adjacent values (the thin whiskers stretching from the bar), which are defined as the first quartile -1.5 IQR and third quartile +1.5 IQR. Additionally, each violin plot contains the kernel density estimation to show the distribution of the data for each month.

C. Summary Statistics: Other Expectations Over Time

As we showed in section 6, the COVID-19 outbreak led to an alteration for other macroeconomic expectations. In this appendix we show additional descriptive graphs of how the qualitative macroeconomic expectations evolved over time. In Figure C1 we plot the answers households gave to the qualitative question about several macroeconomic indicators: i) unemployment rate, ii) credit interest rates, iii) saving interest rate, iv) house prices and v) rents. We observe a large shift over time when it comes to the unemployment rate. As the pandemic unfolded, individuals became considerably more pessimistic about the unemployment rate in the next 12 months. This finding is confirmed in Table C1. When asked whether they expect a strong increase, slight increase, strong decrease, slight decrease or no change in the rate of unemployment, 87% of respondents asked during the pandemic period reported that they expect a strong or slight increase, while before the pandemic hit, in 2019, only 33% expected an increase in unemployment. The majority expected no change or a decrease in the unemployment rate in 2019. When it comes to future interest rates, consumers do not report a large shift in their expectations (Figure C1). Finally, when it comes to the housing market, respondents expected a slowdown for house prices and rents. panels E and F in Figure C1 show that before the pandemic, individuals were expecting increasing home prices and rents. However, this picture changed during the early stages of the pandemic when people became more pessimistic in terms of house prices and rents. Table C1 displays the mean difference between the two periods. In 2019, 81% of the interviewed individuals expected house prices to increase in the next 12 months. In 2020, after the outbreak of the pandemic, only 43% of respondents expected an increase in house prices in the next 12 months. A similar trend is observed for rent growth. The share of respondents expecting an increase in rents changed from 80% in 2019 to 42% in 2020.

Figure C1. Other macroeconomic expectations during the pandemic



Notes: The figure shows the development of consumers' expectations with regard to several qualitative measures of macroeconomic indicators. Each panel reports the share of respondents that answer to the following qualitative question: *"What developments do you expect in the following metrics over the next 12 months for:* A. the inflation rate; B. the unemployment rate; C. credit interest rates; D. saving interest rate; E. house prices; F. rents". The respondents can choose from the following possible answers: i) decrease significantly, ii) decrease slightly, iii) remain roughly the same, iv) increase slightly v) increase significantly. The results are weighted.

Table C1: Before and during COVID -19: mean difference

	(1)	(2)	(3)	
	Before COVID-19	During COVID-19	Difference in means	
D. Incr Unempl	0.33	0.87	0.54***	(0.00)
D. Credit int decrease sign	0.01	0.03	0.02***	(0.00)
D. Incr Savingint	0.08	0.04	-0.04***	(0.00)
D. Incr House Prices	0.81	0.44	-0.37***	(0.00)
D. Incr Rents	0.81	0.43	-0.37***	(0.00)
Observations	6081	6503	12584	

Notes: The table shows the difference in mean results between the average expectations before and during the COVID-19 pandemic. Column (1) reports the average values for the pre-pandemic period. Column (2) reports the average values for the pandemic wave. Column (3) reports the difference between pandemic and pre-pandemic averages and the respective p-values. Strong Incr. Infl. is a dummy variable that is equal to 1 if individuals expect a strong increase in inflation in the next 12 months and zero otherwise. It is constructed from the qualitative indicator. Infl. uncert. is the inflation uncertainty which is captured from the standard deviation of the consumer's subjective distribution. ***, **, * indicate statistical significance at 1, 5 and 10 percent.

D. Regional COVID-19 Dynamics Evidence from Panel Data

Table D1: Robustness check I - Fixed effects estimation results for inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	E. Inflation	Pr (<0)	Pr (0 - 2)	Pr (2 - 4)	Pr (>4)	Strong Incr.	Uncertainty
7-day inc.	0.018***	-0.031	-0.077**	0.011	0.097**	0.00056	0.0043*
	(0.0053)	(0.025)	(0.032)	(0.044)	(0.048)	(0.00060)	(0.0025)
Unempl. (monthly)	-0.12	-1.72	-1.55	4.10**	-0.84	-0.066***	-0.32***
	(0.18)	(1.31)	(1.93)	(1.73)	(2.14)	(0.016)	(0.091)
Stringency index	0.0063	0.13*	-0.32***	0.025	0.17**	0.0012	0.034***
	(0.011)	(0.073)	(0.084)	(0.080)	(0.070)	(0.00094)	(0.0059)
Exp. restrictions	-0.022	0.16	0.028	-0.25*	0.059	-0.0014	0.015*
	(0.014)	(0.13)	(0.13)	(0.13)	(0.13)	(0.0016)	(0.0085)
Age	0.18	-1.95	3.11**	0.52	-1.67	-0.049***	0.060
	(0.17)	(1.32)	(1.47)	(1.38)	(1.28)	(0.014)	(0.068)
With college degree	0.21	2.75	-8.00	3.22	2.03	0.042	-0.074
	(0.52)	(4.29)	(5.83)	(5.26)	(4.22)	(0.045)	(0.26)
Income: EUR 2500 - EUR 4000	-0.36	1.19	-2.78	2.93	-1.35	0.012	0.080
	(0.28)	(2.22)	(2.58)	(2.35)	(2.61)	(0.022)	(0.16)
Income: more EUR 4000	-0.76**	1.63	-3.72	5.84**	-3.75	-0.0043	-0.047
	(0.38)	(2.82)	(3.49)	(2.94)	(3.25)	(0.032)	(0.20)
Owner	0.027	-4.78	2.05	3.16	-0.44	-0.014	-0.011
	(0.62)	(3.13)	(4.67)	(4.63)	(4.34)	(0.039)	(0.22)
Urban	-1.20*	20.1**	6.08	-26.4***	0.28	0.100*	0.45
	(0.66)	(8.98)	(11.4)	(8.76)	(3.81)	(0.059)	(0.44)
Coronavirus a problem	-0.0064	-0.067	0.12	0.19	-0.25	-0.0018	-0.023
	(0.049)	(0.32)	(0.36)	(0.35)	(0.34)	(0.0044)	(0.020)
Economy a problem	0.12**	-0.12	-0.35	-0.58	1.05***	0.016***	0.014
	(0.049)	(0.31)	(0.39)	(0.37)	(0.35)	(0.0040)	(0.019)
Observations	8572	6190	6190	6190	6190	8825	5900
Adj. R^2	0.44	0.26	0.37	0.21	0.45	0.37	0.42
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the results of a fixed effects regression model with robust standard errors clustered at district and individual level. It includes individual and year fixed effects. The period of analysis includes April to June 2019 (pre-pandemic period) and April to July 2020 (first wave of the COVID-19 pandemic). The dependent variables for each column are the following: (1) Expected inflation measured as a point prediction; (2) Probability of expecting inflation realizations that are less than zero; (3) Probability of expecting inflation between 2% and 4%; (4) Probability of expecting the inflation rate to fall between 2% and 4%; (5) Probability of expecting the inflation rate to be more than 4%; (6) A dummy variable that is equal to 1 if individuals expect a strong increase in inflation in the next 12 months and zero otherwise. It is constructed from the qualitative indicator. (7) Inflation uncertainty. The main explanatory variable is the 7-day incidence, which captures COVID-19 severity at district level on the day of the interview. Other explanatory variables include: the unemployment rate in the district, the stringency index, the subjective assessment about the severity of the pandemic and the impact on the economy, age, education, income, homeownership, whether she lives in an urban area. Significance levels are reported as follows: * p<0.10, ** p<0.05, *** p<0.01.

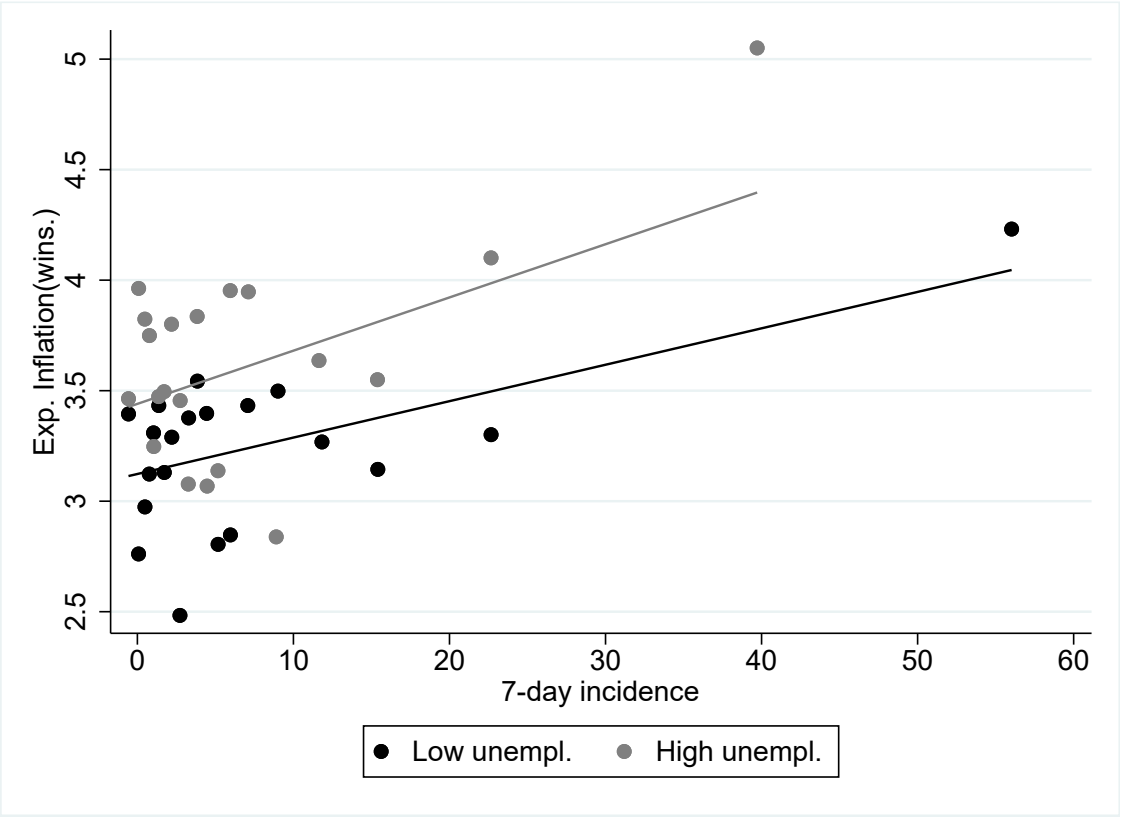
Table D2: Robustness check II - Fixed effects estimation results for inflation expectations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	E. Inflation	Pr (<0)	Pr (0 - 2)	Pr (2 - 4)	Pr (>4)	Strong Incr.	Uncertainty
7-day inc.	0.0099**	-0.051**	-0.022	0.031	0.042	0.00077	0.0010
	(0.0042)	(0.022)	(0.034)	(0.040)	(0.031)	(0.00061)	(0.0014)
Unempl. (monthly)	0.045	-0.18	-4.82**	4.18*	0.83	-0.058***	-0.13
	(0.19)	(1.54)	(2.11)	(2.20)	(2.31)	(0.018)	(0.093)
Stringency index	0.0019	-0.088	0.033	-0.022	0.077	-0.0013	-0.0046
	(0.012)	(0.097)	(0.11)	(0.10)	(0.084)	(0.0014)	(0.0060)
Exp. restrictions	-0.012	0.17	0.025	-0.31**	0.11	-0.0020	0.012
	(0.015)	(0.13)	(0.13)	(0.13)	(0.13)	(0.0016)	(0.0085)
Coronavirus a problem	-0.025	-0.045	0.15	0.24	-0.35	-0.00025	-0.019
	(0.049)	(0.32)	(0.37)	(0.35)	(0.35)	(0.0044)	(0.019)
Economy a problem	0.12**	-0.10	-0.37	-0.59	1.06***	0.015***	0.012
	(0.050)	(0.31)	(0.39)	(0.36)	(0.35)	(0.0041)	(0.019)
Age	0.55	1.20	4.64	-7.15	1.31	0.030	0.035
	(0.47)	(3.87)	(8.71)	(8.38)	(4.54)	(0.024)	(0.41)
With college degree	0.17	3.47	-9.05	3.65	1.93	0.051	0.045
	(0.52)	(4.33)	(5.79)	(5.27)	(4.22)	(0.046)	(0.25)
Income: EUR 2500 - EUR 4000	-0.37	1.49	-2.81	2.56	-1.24	0.0081	0.091
	(0.28)	(2.22)	(2.59)	(2.33)	(2.67)	(0.022)	(0.16)
Income: more EUR 4000	-0.81**	2.12	-3.55	5.41*	-3.98	-0.0067	-0.055
	(0.38)	(2.84)	(3.53)	(2.93)	(3.31)	(0.032)	(0.20)
Owner	-0.16	-3.83	4.05	1.60	-1.82	-0.034	-0.17
	(0.63)	(3.14)	(4.74)	(4.76)	(4.47)	(0.039)	(0.22)
Urban	-2.37*	9.36***	32.2	-45.9*	4.36**	0.058***	0.28
	(1.35)	(1.44)	(29.1)	(27.5)	(2.09)	(0.017)	(0.54)
Observations	12585	10271	10271	10271	10271	12887	9861
Adj. R^2	0.014	0.037	0.050	0.012	0.029	0.037	0.078
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the results of a fixed effects regression model with robust standard errors clustered at district level. It includes individual and month fixed effects. The period of analysis includes April to June 2019 (pre-pandemic period) and April to July 2020 (first wave of the COVID-19 pandemic). The dependent variables for each column are the following: (1) Expected inflation measured as a point prediction; (2) Probability of expecting inflation realizations that are less than zero; (3) Probability of expecting inflation between 2% and 4%; (4) Probability of expecting the inflation rate to fall between 2% and 4%; (5) Probability of expecting the inflation rate to be more than 4%; (6) A dummy variable that is equal to 1 if individuals expect a strong increase in inflation in the next 12 months and zero otherwise. It is constructed from the qualitative indicator. (7) Inflation uncertainty. The main explanatory variable is the 7-day incidence, which captures COVID-19 severity at district level on the day of the interview. Other explanatory variables include: the unemployment rate in the district, the stringency index, the subjective assessment about the severity of the pandemic and the impact on the economy, age, education, income, homeownership, whether she lives in an urban area. Significance levels are reported as follows: * p<0.10, ** p<0.05, *** p<0.01.

E. Additional Figures: Heterogeneity in Inflation Expectations

Figure E1. Correlation between the 7-day incidence and the expected inflation by unemployment group



Note: The figure shows the correlation between the inflation rate and the 7-day incidence in low unemployment regions versus high unemployment regions. The included data span from April 2020 to July 2020, only for the pandemic period.

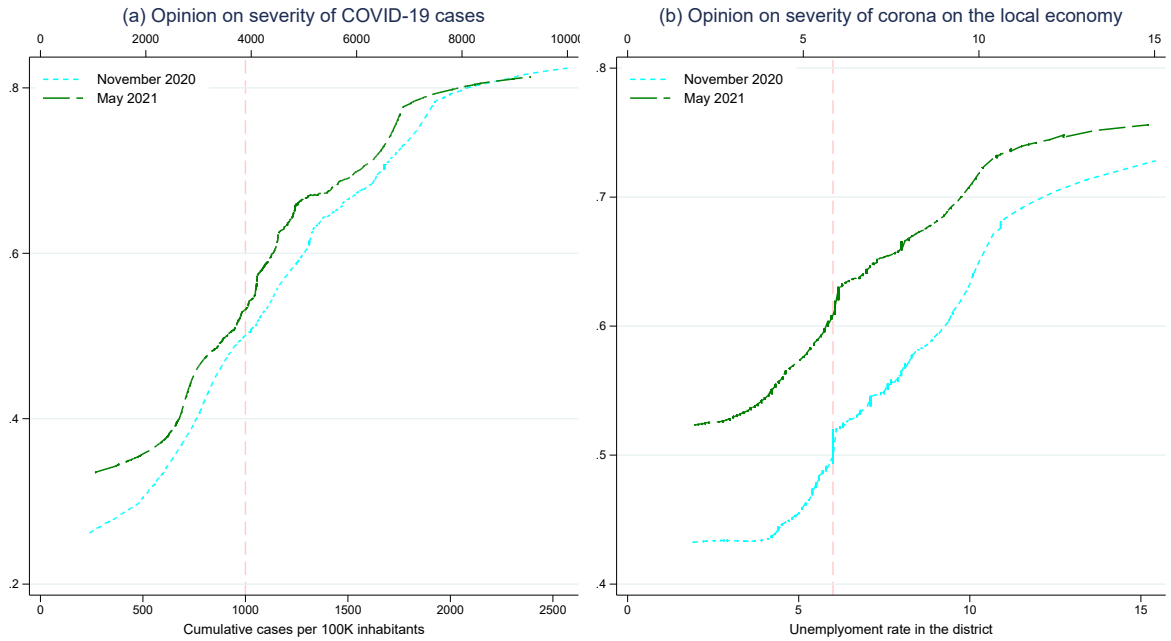
F. Heterogeneity in Perception

To make the heterogeneity in individual perceptions clear, we plot the opinions against the actual number of COVID-19 cases and unemployment rate experienced in the district. We smooth the individual observations using a Lowess smoother to make the graph visually easier to interpret.

Figure F1 shows that there is substantial heterogeneity in perceptions for the same number of cases or unemployment figures experienced. In panel (a) we plot the share of respondents that believe they were severely hit by the pandemic in terms of COVID-19 cases against the

actual cases reported by RKI in the district in November 2020 and May 2021. The x-axes for November 2020 and May 2021 are shown below and above the graph, respectively, because the cumulative cases for the two months were substantially different. Panel (a) clearly shows clearly the heterogeneity in opinions for respondents experiencing the same number of cases. For example, around 50% of individuals that live in a district which experienced 1,000 cases per 100,000 inhabitants in November 2020 report being severely hit by the coronavirus in terms of cases, the other 50% thinks they were not hit severely in terms of numbers. The opinions and perceptions of individuals have less disagreement for very high and very low COVID-19 cases experienced and more disagreement in between. The same is true for individuals' opinion regarding the impact of COVID-19 in their district in terms of the economy (panel b). In November 2020, 50% of those that experience an unemployment rate of 6% report being hit severely in terms of economy due to COVID-19 in their district. This share increases in May 2021 to more than 60%, but the heterogeneity still remains there because the other 40% reports being hit mildly. Overall, Figure F1 shows that there is a lot of heterogeneity in opinions for the same figures experienced for COVID-19 reported cases and unemployment rates.

Figure F1. Correlation between perception and the actual data



Note: Panel (a) plots the Lowess smooth of the opinion of respondents on the severity of COVID-19 cases on the actual cumulative cases per 100,000 inhabitants in the district where the respondent live. Panel (b) plots the Lowess smooth of the opinion of respondents on the severity of COVID-19 on the local economy against the actual unemployment rate experienced in the district. The light blue line reports the results for November 2020, while the green line reports the results for May 2021.

G. Variable Description and Source

Variable	Description	Source
BOP-HH individual level		
Qualitative macroeconomic expectations	What developments do you expect in the following metrics over the next 12 months? (The unemployment rate in Germany; rents in your area; lending rates; interest rates on savings accounts; the inflation rate; property prices in your area) *Potential answer categories*: 1) decrease significantly; 2) decrease slightly; 3) stay roughly the same; 4) increase slightly; 5) increase significantly	Bundesbank Online Panel
Inflation vs deflation	Do you think inflation or deflation is more likely over the next 12 months?	Bundesbank Online Panel
Inflation as point forecast	What do you think the rate of inflation (deflation) will roughly be over the next 12 months?	Bundesbank Online Panel

Inflation probabilistic	In your opinion, how likely is it that the rate of inflation will change as follows over the next 12 months? *Respondents can assign probabilities to the following intervals:* a) The rate of deflation (opposite of inflation) will be 12% or higher; b) The rate of deflation (opposite of inflation) will be between 8% and 12%; c) The rate of deflation (opposite of inflation) will be between 4% and 8%; d) The rate of deflation (opposite of inflation) will be between 2% and 4%; e) The rate of deflation (opposite of inflation) will be between 0% and 2%; f) The rate of inflation will be between 0% and 2%; g) The rate of inflation will be between 2% and 4%; h) The rate of inflation will be between 4% and 8%; i) The rate of inflation will be between 8% and 12%; j) The rate of inflation will be 12% or higher.	Bundesbank Online Panel
Corona a problem	To what extent do you think the Coronavirus pandemic developments are a serious problem	Bundesbank Online Panel
Perception of COVID-19 impact at district level	What would you say: Overall, how strongly has the district or city in which you live been affected by the coronavirus pandemic so far? Please select one answer for each row: a. COVID-19 cases; b. Economic situation 0 (Not affected at all) - 10 (Very strongly affected)	Bundesbank Online Panel
Perception of COVID-19 impact at district level	What would you say: Overall, how strongly has your household been affected financially by the coronavirus pandemic so far? 0 (Not affected at all) - 10 (Very strongly affected)	Bundesbank Online Panel
GDP growth	In your opinion, how likely is it that German economic output will change as follows over the next 12 months? a Increase by 10% or more; b Increase by between 8% and less than 10%; c Increase by between 5% and less than 8%; d Increase by between 2% and less than 5%; e Increase by between 1% and less than 2%; f Increase by between 0% and less than 1%; g Decrease by between 0% and less than 1%; h Decrease by between 1% and less than 2%; i Decrease by between 2% and less than 5%; j Decrease by between 5% and less than 8%; k Decrease by between 8% and less than 10%; l Decrease by 10% or more.	Bundesbank Online Panel
Income growth	In your opinion, how likely is it that your household's average monthly net income will change as follows over the next 12 months? a Decrease by €2,000 or more; b Decrease by between €1,500 and less than €2,000; c Decrease by between €1,000 and less than €1,500; d Decrease by between €500 and less than €1,000; e Decrease by between €250 and less than €500; f Decrease by between €0 and less than €250; g Increase by between €0 and less than €250; h Increase by between €250 and less than €500; i Increase by between €500 and less than €1,000; j Increase by between €1,000 and less than €1,500; k Increase by between €1,500 and less than €2,000; l Increase by €2,000 or more.	Bundesbank Online Panel
Intention to spend more/the same/less on major purchases	Please indicate if you are likely to spend more/the same/less on the following items over the next 12 months than in the last year. a) major purchases (e.g. car, furniture, electrical devices, etc.)	Bundesbank Online Panel

Intention to save	Please indicate if you are likely to spend more/the same/less on the following items over the next 12 months than in the last year. b) financial reserves	Bundesbank Online Panel
Socio-demographics	Age, gender, education, income, household size, living in an urban area, lived in East Germany before 1989	Bundesbank Online Panel
COVID-19 dynamics		
7-day incidence/100,000 pop.	The total number of coronavirus infections within the past seven days per 100,000 inhabitants. The variable is calculated using population numbers from the Statistical Offices of the German States.	Robert Koch Institute; Corona Data Platform
Stringency index	The stringency index is calculated by infas 360 GmbH. It is an index that ranges from 0 to 100 for the stringency of the government measures in place for a specific district on a specific day. For a detailed description of the methodology of constructing the index please refer to the documentation provided on the Corona Data Platform: Corona Data Platform: Maßnahmenindex für Kreise pro Tag	infas 360 GmbH and Corona Data platform
Expected duration of restrictions	This is a measure of each individual's expectation regarding the duration of restrictions measures (in months). The question in the survey is as follows: "How long do you think the restrictions on events and gatherings in response to the coronavirus pandemic will last?"	Bundesbank Online Panel
Regional characteristics		
Unemployment rate (monthly)	Represents the total number of unemployed persons as a percentage of the economically active population at district level.	Federal Employment Agency
Share employed in the service sector (2018)	Proportion of employed people in the service sectors in relation to total employed people as an annual average	Statistical Offices of the German States
Overnight stays (2019)	Overnight stays by guests in accommodation establishments. The tourism intensity (overnight density) is an indicator for the quantitative importance of tourism in a region. The more nights in relation to the local population, the more important the tourism industry is.	Statistical Offices of the German States
Share in knowledge-intensive industries (2014)	The share of employees in knowledge-intensive industries in relation to all employees subject to social contributions in a district.	Federal Employment Agency[20]
Share with academic degree (2014)	Employees with an academic degree are defined here as employees subject to social security contributions who have graduated from a technical college, college or university with an academic degree (at the district level in 2014).	Federal Employment Agency[21]
Population	Population at district level	Statistical Offices of the German States

[20]Downloaded through: https://www.landatlas.de/
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