FEDERAL RESERVE BANK OF SAN FRANCISCO

WORKING PAPER SERIES

Firms' Inflation Expectations in a Monetary Union

Ursel Baumann
European Central Bank

Annalisa Ferrando
European Central Bank

Dimitris Gerogarakos
European Central Bank and CEPR

Yuriy Gorodnichenko
University of California, Berkeley
NBER, and CEPR

Timo Reinelt
Federal Reserve Bank of San Francisco

March 2026

Working Paper 2025-29

https://doi.org/10.24148/wp2025-29

Suggested citation:

Baumann, Ursel, Annalisa Ferrando, Dimitris Gerogarakos, Yuriy Gorodnichenko, and Timo Renelt. 2026. "Firms' Inflation Expectations in a Monetary Union." Federal Reserve Bank of San Francisco Working Paper 2025-29. https://doi.org/10.24148/wp2025-29

Firms' Inflation Expectations in a Monetary Union*

Ursel Baumann Annalisa Ferrando Dimitris Georgarakos

Yuriy Gorodnichenko Timo Reinelt

March 2026

Abstract

Using data from the euro area SAFE, a novel survey of firms' inflation expectations including a randomized controlled trial (RCT), we show that firms' inflation expectations exhibit significant heterogeneity, challenging the predictions of full-information rational expectations models. At the same time, we document that firms form beliefs consistent with rational Bayesian updating under incomplete information, with geographic location playing a dominant role in shaping expectations. Firms extrapolate from regional and national inflation to form euro area inflation expectations. A basic "Lucas island" model calibrated to euro area data replicates key empirical moments and highlights the structural "pass-through" from national to aggregate expectations. Our findings underscore challenges in anchoring inflation expectations in a heterogeneous monetary union.

*Baumann: European Central Bank, ursel.baumann@ecb.europa.eu. Ferrando: European Central Bank, annalisa.ferrando@ecb.europa.eu. Georgarakos: European Central Bank and CEPR, dimitris.georgarakos@ecb.europa.eu. Gorodnichenko: University of California, Berkeley, NBER, and CEPR, ygorodni@berkeley.edu. Reinelt: Federal Reserve Bank of San Francisco, timo.reinelt@sf.frb.org. We thank the editor, Christopher Roth, and three anonymous referees for excellent comments. We also thank conference and seminar participants at the ECB, the Inflation: Drivers and Dynamics Conference, the Central Bank Business Survey Conference, the ifo Conference on Macroeconomics and Survey Data, and the BSE Summer Forum, and especially Philippe Andrade (discussant) and Christophe Kamps for useful comments. We thank Giada Durante and Aayush Singh for excellent research assistance. A previous version of this paper was titled "SAFE to Update Inflation Expectations? New Survey Evidence on Euro Area Firms". The dataset employed in this paper contains confidential statistical information. Its use for the purpose of the analysis described in the text has been approved by the relevant ECB decision making bodies. All the necessary measures have been taken during the preparation of the analysis to ensure the physical and logical protection of the information. The views expressed in this paper are those of the authors and do not necessarily represent the views of the ECB, the Eurosystem, the Federal Reserve Bank of San Francisco, or the Federal Reserve System.

1 Introduction

Inflation expectations represent a crucial variable for monetary policymakers, as they shape economic agents' behavior and influence the transmission of monetary policy. The inflation expectations of firms are particularly important because they directly affect pricing, wage setting, and investment decisions, all of which have significant macroeconomic consequences. Notably, firms' inflation expectations are highly heterogeneous. Empirical evidence shows that firms exhibit substantial disagreement about expected inflation and report considerable uncertainty surrounding their point forecasts (Kumar et al., 2023). These patterns stand in stark contrast to the predictions of the full-information rational expectations (FIRE) framework, which assumes a common information set and shared uncertainty. In this paper, we propose that firms in a monetary union form aggregate inflation expectations through a process of localized learning, whereby they extrapolate from regional and national inflation signals to form their beliefs about euro area inflation.

We utilize data from the Survey on the Access to Finance of Enterprises (SAFE), a comprehensive survey of euro area firms conducted jointly by the European Central Bank (ECB) and the European Commission. Our analysis leverages a recent expansion of the survey, which includes novel questions on firms' inflation expectations, their perceptions of the ECB's inflation target, their forward-looking plans, as well as the implementation of a randomized controlled trial (RCT). The SAFE dataset offers several key advantages: it provides harmonized and consistent measurement of expectations across a diverse set of countries within a heterogeneous monetary union, and it explicitly captures both national and euro area inflation expectations. Understanding the sources of disagreement in firms' inflation expectations is challenging, as several mechanisms could plausibly explain this heterogeneity. Distinguishing among these explanations is inherently difficult with observational data alone, as beliefs can be confounded by differences in business models and incentives, information sets, and cognitive processing. This challenge echoes Sargent's (2008) notion of the "wilderness", where disentangling the underlying drivers of observed expectations requires careful consideration of competing hypotheses and potential confounders.

To investigate how firms form inflation expectations, we design and implement an RCT embedded in the SAFE survey. In our experimental setup, treated firms were provided with publicly available information about euro area inflation. The results reveal that firms form expectations under incomplete information, but in a manner consistent with rational Bayesian updating. Specifically, firms adjust their inflation expectations in response to the information treatment, with larger adjustments observed when their prior beliefs deviate more significantly from the provided signal, aligning with the predictions of Bayesian updating (Coibion et al., 2018). Importantly, we also document that the extent of belief adjustment varies systematically with the level of inflation in a firm's country and region, a pattern consistent with rational inattention (Sims, 2003; Weber et al., 2025). Furthermore, we establish that changes in inflation expectations have meaningful implications for firm behavior: exogenous variation in expectations, induced by the RCT, significantly influences

firms' price-setting plans, thus confirming that their beliefs are relevant for economic outcomes.

We highlight systematic heterogeneity in firms' inflation expectations, which varies with observable characteristics such as number of employees, firm age, and leverage – again consistent with rational inattention. To further assess the factors potentially contributing to this heterogeneity, we employ a Shapley (1953) decomposition to rank the explanatory power of a wide range of observables, including firm characteristics, choices, constraints, sector, and geographic location. We find that geographic location overwhelmingly dominates, accounting for 65% of the total explained variation in firms' inflation expectations. This striking result underscores the central role of local and regional factors in shaping firms' inflation expectations, highlighting the importance of firms' location in understanding expectation formation.

To explain the importance of firms' location in shaping their inflation expectations, we build on Lucas (1972) and the subsequent literature, which emphasizes that agents extrapolate from local conditions to form perceptions of aggregate variables. In support of this mechanism, we provide two novel facts. First, we show that firms' national inflation expectations are strongly correlated with their euro area inflation expectations. Second, we show that actual inflation rates at the level of countries and at the level of regions within countries tend to influence firms' euro area expectations. Specifically, we obtain inflation data for more than 60 NUTS regions across five euro area countries where such data are available from national statistical offices (Germany, Spain, Finland, Italy, and Portugal). We document a strong positive association, whereby a 1 percentage point increase in the regional inflation rate is associated with an $\approx$0.4 percentage point increase in firms' euro area inflation expectations. Crucially, this relationship is present even within countries, indicating that extrapolation is not solely driven by country-level shocks. These results are consistent with firms extrapolating from local conditions to expectations regarding euro area inflation. Our finding is also robust to controlling for GDP growth and unemployment rates in the firms' regions, as well as to controlling for various firm characteristics. Furthermore, we document that firm heterogeneity in the degree of extrapolation is consistent with rational inattention: firms with larger export shares, which are more exposed to aggregate conditions, exhibit significantly less extrapolation from regional inflation rates.

To account for these findings, we build a basic Lucas (1972)-type island model. In the model, firms are located in a given country and region, and form expectations about euro area inflation based on noisy signals about euro area and national inflation, as well as by observing regional inflation. We calibrate the model to euro area data and the stylized facts documented above. The model can match a number of untargeted empirical moments, such as the correlation between national and euro area inflation expectations. The model also predicts considerable uncertainty around firms' point forecasts, in line with the data. Given that the calibration implies a large degree of noise in firms' signals, the model is also consistent with the empirical response of firms' beliefs to new information in our RCT.

Indeed, we reproduce the RCT in our model by providing firms with an additional signal,

matching the precision in the signal to the empirically estimated treatment effects on beliefs. We find that the model predicts a 23% reduction in disagreement across firms, in line with the data. Finally, we use the model to show that there is a structural "pass-through" from national to euro area inflation expectations, whereby changes in national inflation expectations caused by within-country, regional shocks, affect euro area beliefs. We estimate this pass-through in the data using a model-consistent 2SLS estimator and find that a 1 percentage point higher inflation expectation at the national level raises euro area inflation expectations by 0.3 percentage points.

We also use the survey to elicit firms' perceptions of the ECB's inflation target. This allows us to examine how realized inflation influences firms' understanding of the central bank's objective. We find that firms' perceived inflation target is strongly correlated with medium-run, rather than short-run, regional inflation. In other words, firms located in regions that experienced persistently higher inflation tend to report higher values for the ECB's target. This finding suggests that prolonged deviations in regional inflation may also shape longer-term perceptions about monetary policy objectives, complicating communication strategies and posing risks to the anchoring of inflation expectations.

We contribute to several strands of research. First, we introduce a new survey of firm inflation expectations to the profession. As a result, we provide not only a relatively scarce input for many countries but also continue the momentum to build a durable survey-based infrastructure for monetary policymaking in the euro area (e.g., Georgarakos and Kenny 2022, Savignac et al. 2024) and beyond (e.g., Candia et al. 2024). In this context, we implement consistent measurement across countries, and provide new insights on the relationship between local and aggregate inflation expectations in monetary unions. We thereby also provide additional moments to inform models of expectations formation.

Second, we contribute to a rapidly growing literature on characterizing the expectation formation of households and firms by estimating causal effects of information treatments on expectations and choices (see, e.g., Draeger et al. 2024 and Abberger et al. 2024). Our RCT provides novel estimates of firms' responses in a high-inflation environment, while the vast majority of previous studies for advanced economies provided estimates in low-inflation settings (e.g., Coibion et al. 2022, Savignac et al. 2024). Link et al. (2023) compare information frictions of firms and households. Weber et al. (2025) show that the impact of inflation-related information treatments on expectations varies systematically with the level of inflation. We extend this finding to the setting of a monetary union where firms' response to information depends on the level of inflation across different countries and regions.

Third, we systematically study the determinants of firms' inflation expectations. Unlike household surveys, surveys of firms often lack detailed information on firm and respondent characteristics and thus it is unclear which factors can account for time-series and cross-sectional variation in beliefs. Leveraging the richness of our survey, we investigate the predictive power of various firm characteristics and thus contribute to a large literature focused on understanding why various agents

in the economy have different beliefs (see, e.g., D'Acunto et al. 2023 for a survey of the literature on household expectations). Our results show that the geographic location and locality-specific inflation rates dominantly shape firms' aggregate inflation expectations. We also find evidence for rational inattention as in Weber et al. (2025), Pfäuti (2025), and Link et al. (2025).

Fourth, we contribute to the literature studying the effects of dispersed information and the role of local and salient signals. Lorenzoni (2009) shows that local signals can generate aggregate business cycles when information is dispersed. Cavallo et al. (2017) and D'Acunto et al. (2021) find that salient grocery prices shape households' inflation expectations. Lindemann (2025) establishes that household-specific inflation rates shape aggregate expectations consistent with Lucas (1972). Andrade et al. (2022) document that firms' inflation expectations are shaped by industry-specific shocks. We provide novel evidence on the role of local inflation rates for firms' aggregate inflation expectations leveraging a setting with many countries and regions.

2 A new survey for euro area firms' inflation expectations

2.1 The ECB's Survey on the Access to Finance of Enterprises

The Survey on the Access to Finance of Enterprises (SAFE) is a European firm-level survey covering more than 11,000 firms, launched in 2009. Until 2023, the survey was conducted twice a year: once by the ECB, covering euro area countries, and once in cooperation with the European Commission, covering all EU and some EU neighboring countries (around 16,000 firms). Following a pilot phase that lasted between June 2023 and December 2023, starting from January 2024, the survey frequency is increased to quarterly, with the additional rounds covering a reduced sample of almost 6,000 euro area firms.

The survey contains information on various firm characteristics (for example, employment, broad sector, autonomy, turnover, age, and ownership) and on each firm's assessment of recent developments associated with its economic situation and its financing, including the firm's financing needs and access to finance (Appendix Table A.1 provides some descriptive statistics and Appendix Table A.2 provides an overview of the main variables covered in the survey). The sample comprises non-financial firms across the manufacturing, construction, trade, and services sectors, thus excluding firms in agriculture, public administration, and financial services. More than 90% of the surveyed firms are small and medium-sized enterprises (SMEs).

Until 2023, firms in the sample were randomly selected from the Dun & Bradstreet business register, complemented with other (mainly local) sources in some countries where the Dun & Bradstreet register was not sufficient or not available. Since the 2024Q1 round, firms are selected from the Moody's Orbis database. The survey company employs a comprehensive contact strategy that combines email and telephone outreach to ensure balanced and timely data collection. The email campaign begins with a pre-announcement sent one week prior to the start of fieldwork, followed

by invitations the next week and four subsequent waves of reminders. Simultaneously, telephone recruitment is conducted, targeting both new participants and panelists without email addresses. During the initial days, priority is given to micro firms to enhance completion rates. In some countries, the telephone outreach begins earlier to address anticipated challenges in achieving the desired response rate. Non-responding panelists are progressively contacted by phone after each email wave. The data collection progress is closely monitored at the country level to minimize significant timing differences in completion rates across the euro area. To maintain a balanced panel, the proportion of consecutive repeated responders must not exceed 50% of the total sample size. To achieve this, a fresh sample of firms is drawn subject to specific replacement targets: at least one quarter of micro firms, one sixth of small and medium-sized firms, and one twelfth of large firms must be newly included. Minimum fresh sample quotas are established for each country and firm size category to ensure representativeness and support a robust panel for subsequent survey rounds. The sample is stratified by country, enterprise size class, and sector to ensure a satisfactory representation across activities and size classes. The derived statistics are computed using appropriate survey weights that reflect the proportions of the economic weight (in terms of number of employees) of each size class, sector, and country.[1]

Until 2023, the fieldwork usually ran over a period of six weeks. As of 2024, survey rounds in Q2 and Q4 have a shorter fieldwork period of three weeks, while the fieldwork period of the Q1 and Q3 rounds runs over six weeks as before. Currently, the survey is carried out on behalf of the ECB and the EC by Verian, in cooperation with the fieldwork provider GDCC. The survey is mostly conducted by telephone, with ≈20% of respondents filling in an online questionnaire. Firms can opt to repeat their participation in the survey by indicating their willingness at the end of the questionnaire. In 2023, the average percentage of firms having participated in the survey at least twice reached 80% of the overall number of surveyed firms. However, the average percentage of firms present in at least two consecutive survey rounds is ≈30%. Respondents are typically top-level executives, i.e., general managers, financial directors, or chief accountants.[2]

2.2 Questions on euro area and national inflation expectations

In the June 2023 pilot round of the SAFE, we asked firms experimental questions on inflation expectations. The SAFE is a natural vehicle for gathering firms' inflation expectations, being a well-established, large firm survey providing a representative sample that allows statistical inference about the whole population of firms. The new questions on inflation expectations were added to the end of the questionnaire, i.e., after the existing sections covering the economic situation and

[1] See *Methodological information on the survey and user guide for the anonymized micro dataset* (July 2025), for further methodological information on the SAFE, available under https://www.ecb.europa.eu/stats/pdf/surveys/sme/ecb.safemi.en.pdf.

[2] This is ensured by asking the following question at the start of the survey: "*May I speak with the most appropriate person – the person best able to provide information on how your company is financed? [READ IF NECESSARY: This person could be the owner, a finance manager, the finance director or the chief financial officer (CFO).]*"

financing of firms.

The sample of the June 2023 pilot round consisted of 5,773 completed interviews. The fieldwork took place between 25 May and 23 June 2023. The countries covered were Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Slovakia, and Spain. A follow-up round was implemented in December 2023 (reaching 5,881 firms). Among them, 730 firms were interviewed in both pilot rounds.

In a first set of questions, we elicit firms' expectations of future inflation at three horizons, namely in twelve months, three years, and five years. In this paper, we focus largely on 1-year-ahead inflation expectations. Baumann et al. (2025) analyze the evolution of firms' 3-year-ahead and 5-year-ahead euro area inflation expectations from 2023 to 2024 and the implications for the anchoring of firms' inflation expectations.

Firms were randomly split into two groups. Firms in the first group, assigned with a probability of 75%, were asked questions about euro area inflation expectations:

> *What do you think the euro area inflation rate will be at the following points in time? Please provide your answer as an annual percentage rate.*
>
> *(a) in 12 months*
> *(b) in three years, i.e., in 2026*
> *(c) in five years, i.e., in 2028*

Firms in the second group, with a probability of 25%, were asked about inflation in the country of their main operations (emphasis added):

> *What do you think the inflation rate* ***in your country*** *will be at the following points in time? Please provide your answer as an annual percentage rate.*
>
> *(a) in 12 months*
> *(b) in three years, i.e., in 2026*
> *(c) in five years, i.e., in 2028*

We opted for a "general" inflation question (rather than a specific index) to avoid low response rates (Coibion and Gorodnichenko, 2026). At the same time, interviewers had been instructed to provide additional clarification to all respondents that the intended price index is the Harmonised Index of Consumer Prices (HICP).[3]

Firms were at this stage not provided with further information, for example about recent inflation outturns, to avoid nudging their answers in a certain direction.[4] Previous research has shown that

[3]The additional information provided was: "*The inflation rate is the percentage change over the previous 12 months in the prices of goods and services purchased by households. The Harmonised Index of Consumer Prices (HICP) is used to measure consumer price inflation in the euro area.*"

[4]Such priming is done, for example, for part of the sample in the Bank of Italy's Survey on Inflation and Growth Expectations, which provides respondents with information about the latest HICP inflation rate both in Italy and the euro area, see Appendix Table A.4.

priming firms with such information affects the level and dispersion of inflation forecasts (see Coibion et al., 2020). At a later stage, firms were split into control and treatment groups, with the latter being provided with additional information about euro area inflation, as we describe in the next subsection.

In addition to the questions on point forecasts, firms were asked about the uncertainty attached to various inflation outcomes at the 5-year (i.e., long-term) horizon. The aim of this question was to assess the likelihood that firms attach to euro area inflation outcomes in the long-term well above or below the ECB's inflation target of 2%. Such questions can inform policymakers about the balance of risks attached by firms to the inflation outlook. Ideally, the question would have covered the probability of inflation outturns across several bins or scenarios to get a good understanding of the entire probability distribution. This can be done by asking managers to assign probabilities to a fixed set of scenarios (e.g., Kumar et al., 2015) or flexible, self-reported scenarios (e.g., Kumar et al., 2023). However, asking respondents such complex, detailed questions – especially in a survey primarily conducted over the phone – has significant challenges. Aside from adding considerably to the length of interviews (see below for further discussion), such complex questions risk receiving responses that are not well-behaved, for example with probabilities not adding up to 100% or probability distributions not being consistent with the point estimates reported by a given firm. As a result, we opted for a simpler version where firms are asked to provide only the probabilities attached to two ranges:

> *You indicated earlier that your expectation for inflation in five years, i.e., in 2028, is [the firm's baseline response provided earlier]. All expectations regarding future inflation are surrounded by uncertainty. Therefore, still considering inflation in five years, i.e., in 2028, what do you think is the probability of inflation being above or below the following levels? Please consider the following two alternative scenarios and provide your answer as a percentage.*
>
> *(a) Above [1.5 × the firm's baseline response provided earlier]%*
> *(b) Below [0.5 × the firm's baseline response provided earlier]%*

To give an example, if a firm responded to question Q1 that their baseline expectation is for inflation to stand at 3% in 2028 (i.e., in five years), then they were asked in question Q2 how likely they considered an outcome of inflation above 4.5% or below 1.5% at the same horizon. The middle range (in this example between 1.5% and 4.5%) can be calculated as a residual. We will use the coefficient of variation as our preferred measure of uncertainty, which is a measure of relative dispersion around the point forecast and therefore less sensitive to the level of inflation. Given the structure of the question, one can compute the coefficient of variation as $CV = \sqrt{p_{high} + p_{low}}/2$ where p_{high} is the probability assigned to [1.5 × point prediction] and p_{low} is the probability assigned to [0.5 × point prediction]. While well suited for a phone interview, this simplified way of measuring subjective

uncertainty is less flexible than eliciting the full subjective probability distribution, which may matter if agents' point forecasts differ widely.

In the second pilot round in December 2023 firms were asked the same questions as above on euro area inflation expectations and national inflation expectations.

2.3 Randomization

To allow for a randomized information treatment of certain groups of firms, the survey module on firms' inflation expectations consists of three stages. Figure 1 depicts the survey structure.

Stage 1: Survey questions, pre-treatment. In the first stage, firms were randomly assigned, with even probabilities, to one of four groups. Firms in all groups were asked to provide their point forecasts of future inflation at three horizons, namely in twelve months, three years, and five years. Groups 1-3 were asked a question about their expectations regarding euro area inflation, while group 4 was asked about their expectations regarding the inflation rate in their country. We verify that observable firm and manager characteristics do not predict group assignment (based on joint F-tests), see Appendix Table A.5.

Stage 2: Information treatment. In the second stage, firms in groups 1-2 were provided with additional inflation-related information, while groups 3 and 4 did not receive any information. Group 3 therefore serves as the control group for the replies about euro area inflation expectations. Firms in group 1 were provided with the latest available euro area HICP inflation outturn, which referred to the month of April 2023, when inflation stood at 7.0%.[5] Firms in group 2 were provided with the latest available expert inflation expectations (one-year-ahead horizon) from the European Central Bank's Survey of Professional Forecasters.[6] The provided forecast was 2.8% and referred to the average expected inflation rate in the second quarter of 2024.

Stage 3: Survey questions, post-treatment. In the third stage, firms in groups 1 and 2 were once again asked about their baseline euro area inflation expectations over the three horizons. Specifically, the survey asks after each treatment, "*In light of this information, what do you think the inflation rate in the euro area will be at the following points in time? Please provide your answer as an annual percentage rate.*" The remaining groups were not asked a second time. On the one hand, this was done to keep the questionnaire shorter for some survey participants, to alleviate concerns about enlarging the questionnaire that was already deemed long and to address limitations of phone-based interviews. On the other hand, this can in principle generate a confound in treatment effects estimated later on, as part of the revisions observed in the treatment groups may reflect adjustments other than learning from the provided information, especially as treated groups were asked the exact same question again (Fuster et al., 2022). At the same time, this

[5]The exact wording was: "*We would now like to provide you with some information about the inflation rate in the euro area. In April 2023, the annual inflation rate in the euro area was 7.0%*".

[6]The exact wording was: "*We would now like to provide you with some information about the expected inflation rate in the euro area going forward. The Survey of Professional Forecasters (SPF) is a survey of professional economists. According to the latest data, they expect, on average, inflation in 12 months to be 2.8%.*"

confound effect may be quantitatively limited for firms. For example, Kumar et al. (2023, Table 2) estimate that the slope coefficient relating inflation posteriors to priors for the control group is 1.10, and Abberger et al. (2024, Table 5) estimate 0.98 for the same slope coefficient, both close to the coefficient of 1 that is imposed by our setup.

2.4 Questions on firms' economic plans

In the post-treatment part of the module, firms were also asked about their future economic plans, or more concretely, about their quantitative expectations over the next 12 months regarding the percentage change in the respective firm's average selling prices, non-labor costs, wages, and number of employees. In addition to providing further information about firms' own economic plans, these questions allow assessing the relationship between such plans and the firms' aggregate inflation expectations. The wording of these questions was as follows:

> *Looking ahead, by how much do you expect the following to increase or decrease over the next 12 months? Please provide your answer as a percentage change.*
>
> *(a) Your average selling price of products or services in your main markets*
> *(b) The average prices of production inputs (non-labor costs such as materials and energy)*
> *(c) The average wage of your current employees*
> *(d) Your number of employees*

2.5 Question on firms' perceived inflation target

In the 2024Q4 round of the SAFE, a set of ad hoc questions was introduced to assess firms' perceptions about the ECB's price stability objective, which we also use in this paper. One question, in particular, asked firms about their quantitative understanding of the ECB's inflation target:

> *The European Central Bank's primary objective is to maintain price stability. In your firm's view, what inflation rate does the ECB target? Please provide your answer as an annual percentage rate.*

2.6 Measuring firms' location and regional inflation

We observe firms' location at the level of regions by linking the survey to the Orbis database which reports the Eurostat two-digit NUTS region (NUTS-2 for short) of a firm's headquarter. We utilize official regional HICP data retrieved from national statistical offices. Monthly HICP data are available at the NUTS-2 level for Portugal, Italy, Finland, and Spain, and at the NUTS-1 level for Germany. The data are available from national statistical institutes and Haver Analytics. Other euro area countries do not compile HICP inflation at disaggregated geographic levels. Overall, we

observe regional inflation across 69 regions. The standard deviation in regional inflation rates within countries is between 0.4 and 0.8 (Appendix Table A.3). Throughout the paper, unless otherwise noted, we measure inflation as a four-quarter backward-looking moving average of official year-over-year HICP inflation. This aims at averaging out seasonal fluctuations that do not materially affect agents' expectations and thus could attenuate our estimates. However, all results also hold when we use raw inflation or alternative bandwidths.

2.7 Data validation

Despite the advantages of introducing these new questions on inflation expectations in the SAFE, enlarging an existing survey also implied facing constraints and challenges. Indeed, the existing questionnaire was already relatively long, with an average interview time of about 20 minutes. Raising the interview time substantially further was seen as risking an increase in dropout rates during the interviews. As a result, only a few, carefully selected questions could be added to the questionnaire. A further challenge was how firms would cope with quantitative questions (i.e., asking about a percentage change in a variable) regarding firms' expectations of macroeconomic variables, within a survey that so far contained largely qualitative questions (i.e., asking whether a variable has increased, stayed the same or decreased) about firm-specific variables.

To evaluate these challenges and optimize the questions, the pilot phase included a careful validation in two broad areas: benchmarking against other available surveys of inflation expectations and listening to some of the interview recordings to draw conclusions on the difficulty faced by firms to respond to the new questions. First, as regards benchmarking, other firm surveys in the euro area that contain questions on inflation expectations are available for Germany, France, and Italy, and are run by the Bundesbank, Banque de France, and Banca d'Italia, respectively.[7] These surveys have in common that they elicit firms' inflation expectations over various horizons, ranging from short to the longer-term, despite some differences in the exact horizons. However, there are also conceptual differences. In general, national firm surveys ask about firms' national inflation expectations. While the French and German surveys ask about the country-level "inflation rate", the Italian survey specifies the price index (Harmonised Index of Consumer Prices) in its question and provides information about recent inflation outturns or about the ECB's inflation target to a subsample of firms. The German survey is the only survey that, like the SAFE, asks also about uncertainty attributed to various inflation outcomes. The surveys also differ in terms of survey mode, outlier treatments, as well as size thresholds for firm coverage.

Second, as regards analyzing interview recordings, firms' responses showed a wide variation in the extent to which they were informed about the macroeconomic concept of inflation. Some firms provided precise responses and/or referred to the inflation target of the ECB in their reply. Others found the questions about the inflation outlook more challenging compared with those about

[7] Appendix Table A.4 summarizes the main features of these surveys.

the access to financing or their own economic plans. Those respondents mentioned, for example, that they had little idea about the level of the inflation rate. Overall, these challenges were also reflected in a lower response rate for the questions on inflation expectations (with a non-response rate of 23%) compared with other qualitative questions, for instance on companies' main indicators, where the non-response rate was around 3%, but also compared to quantitative questions on selling prices, where this was around 16%.[8] However, we find little systematic relationships between firm characteristics (firm size, employment, age, and sector) and the non-response rate for euro area inflation expectations, national inflation expectations, or the perceived inflation target. Most country fixed effects are significant, but the estimated coefficients are economically small relative to average non-response rates (see Appendix Table A.6). We also find that re-weighting the data with inverse probability weights reflecting the frequency of non-response as a function of firm size, employment, sector, age, and country fixed effects does not affect aggregate moments in the data (see Appendix Table A.7).

Throughout this paper, to ensure that our analysis is not driven by outliers, we trim inflation expectations for all horizons at -1% and 30%. This affects about 1.4% of observations for euro area inflation expectations and 1.2% for national inflation expectations. When we aggregate data to the regional level, we drop regions with fewer than five observations.

3 Survey data on euro area firms' inflation expectations

3.1 Firms' expectations about euro area and national inflation

We start by describing the survey data on firms' inflation expectations. Table 1 reports basic moments of expectations for euro area inflation (columns (2)-(4)) and national inflation (columns (5)-(7)) at the aggregate level. Panel A of Figure 2 plots the distribution of euro area inflation expectations across firms. In 2023Q2, the average 1-year-ahead expectation for euro area inflation was 5.8 percent, roughly equal to actual inflation at the time of the survey (6.0 percent). Over time, firms' inflation expectations declined as actual inflation moved towards 2%.[9]

There is considerable variation in the moments of euro area inflation expectations across countries, see Panel B of Table 1. For example, Slovakian firms predict 8.55 percent inflation in the euro area over the next 12 months, while Portuguese firms project 5.13 percent inflation. In a similar spirit, Slovakian firms disagree more than Portuguese firms: standard deviations in 1-year-ahead inflation forecasts are 4.11 and 2.33 percent, respectively. While disagreement is generally higher

[8] Some firms encountered difficulties answering the question about inflation uncertainty within the overall long questionnaire. Therefore, after the completion of the pilot phase, we simplified this question to a qualitative form: "*How do you see the main risk to the outlook for inflation in five years' time? [A risk to the downside/Risks are broadly balanced/A risk to the upside/DK].*"

[9] An extensive analysis of the evolution of firms' euro area inflation expectations throughout the disinflation episode 2023–2024 can be found in Baumann et al. (2025).

when inflation expectations are high on average, some countries have high disagreement even when inflation forecasts are low (e.g., Spain).

To benchmark firms' euro area expectations, we also report the corresponding statistics for households (Consumer Expectations Survey run by the ECB, see Georgarakos and Kenny (2022)) and for professional forecasters (Survey of Professional Forecasters run by the ECB, see European Central Bank, 2023).[10] In line with Candia et al. (2023), we find that the moments of firms' inflation point forecasts fall between those of households and professional forecasters. That is, firms' average expectations are higher than those of professional forecasters and closer to those of households. Moreover, firms' expectations exhibit greater disagreement than professional forecasters' but less than that observed among households.

Table 1 also reports moments for firms' expectations about inflation in their own countries, i.e., national inflation. Building on the unique nature of this survey module that allows studying both national and union-level expectations within a single survey, Figure 3 compares the distributions of national and euro area 1-year-ahead inflation expectations. Overall, the properties of firms' expectations about national and euro area inflation are qualitatively similar, i.e., levels and dispersions of euro area and national inflation expectations are in the same ballpark for most countries. To shed more light on the relationship between "aggregate" and national inflation expectations within monetary unions, we analyze the correlation between national and euro area expectations in more detail in Section 5.

3.2 Firms' perceived inflation uncertainty

To characterize the expectation formation of firms, it is important to assess how uncertain they are about the precision of their point forecasts. Panel A of Table 2 presents summary statistics for various measures of uncertainty in 5-year-ahead inflation forecasts.[11] Generally, firms are fairly uncertain about their point forecasts. Consistent with other surveys, the standard deviation of point forecasts that indicates disagreement (column (3)) is discernibly higher than the standard deviation in uncertainty (column (6)). This pattern is important because it calls for variation in "long-term" priors about inflation (see Coibion et al., 2021). There is also apparent cross-country variation in the average coefficient of variation (CV) implied by reported subjective probability distributions. The CV ranges from 0.28 in Belgium to 0.42 in Greece. Columns (8) and (10) of Table 2 and Panel A of Figure 4 document that the right tail of the subjective probability distributions is typically thicker than the left tail, i.e., firms expect a higher upside risk in inflation. Panel B of Figure 4 shows that the probability assigned to the lower tail increases in inflation while the probability assigned to the upper tail decreases in inflation. This pattern is consistent with firms expecting some mean reversion in inflation. This pattern can also rationalize why our CV measure ($CV = \sqrt{p_{high} + p_{low}}/2$) is only

[10] Comparing with national firm surveys, predictions in 2023Q2 for firms' inflation expectations are 5.8% in Italy, 4.0% in France; and 6.1% in Germany, based on the surveys run by corresponding central banks.

[11] Recall that the survey elicits firms' perceived uncertainty only for the 5-year horizon.

weakly correlated with the level of inflation (Panel C of Figure 4) as changes in the tails roughly offset each other.

3.3 Firms' perceived euro area inflation target

Table 1 (columns (8)-(10)) further reports moments for firms' perceived ECB inflation target, which was elicited in 2024Q4. Consistent with the ECB's inflation target, 47% of firms perceive an inflation target of 2%, which is also the median and modal answer for all countries in our sample. Nevertheless, there is large dispersion across firms, both in average perceptions across countries and firm-level perceptions within countries, as shown in Panel B of Figure 2.[12] Appendix Figure A.1 further shows the country-specific distributions of perceived inflation targets. For example, the average perceived inflation target of Finnish firms is 2.17%, while Austrian firms perceive the inflation target to be 3.20% on average. In the cross-section of firms, the level of the perceived inflation target and the likelihood of perceiving a target different from the ECB's objective are related to firm characteristics, see Appendix Figure A.3 and Appendix Table A.14. For example, firms with more employees perceive the inflation target to be lower and are less likely to report an inflation target different from 2%. Compared to households, firms tend to have lower perceived inflation targets, similar to what we observe for inflation expectations. In particular, comparing to the Consumer Expectations Survey (CES), we find that the median household inflation target is also 2%, but firms' mean inflation target and standard deviation are lower than those of households, i.e., firms' perceived inflation target is less right-skewed. Below, we return to the relationship between firms' inflation target and inflation rates in their countries and regions in detail.

4 Treatment effects on beliefs across countries and regions

To identify information frictions in firms' expectations formation, we use the randomized controlled trial (RCT) component of our survey, which generates an exogenous shift in firms' information set. This allows us to establish a causal link from a firm's information set to its beliefs about inflation. We also measure firms' post-treatment plans and expectations, including their price-setting, wage, and employment expectations, to analyze causally how firms act on their inflation expectations.

[12] Since our survey was carried out during a period of high inflation, our results likely reflect firms being relatively well informed about the ECB's inflation target. Consistent with this, Coibion and Gorodnichenko (2025) show that households in the U.S. became more aware of the FOMC's inflation objective after the post-COVID high-inflation period.

4.1 Baseline specification

To explore the treatment effects of providing firms with information about euro area inflation on their beliefs, we follow Coibion et al. (2022) in using the following specification:

$$E_{i,t}^{post}[\pi_{t+1}] = a_0 + a_1 E_{i,t}^{prior}[\pi_{t+1}] + \sum_j b_j \times E_{i,t}^{prior}[\pi_{t+1}] \times \mathbb{1}\{i \in \text{Treatment } j\} \quad (1)$$
$$+ \sum_j c_j \times \mathbb{1}\{i \in \text{Treatment } j\} + controls_{i,t} + error_{i,t},$$

where $E_{i,t}^{prior}[\pi_{t+1}]$ is the elicited pre-treatment (prior) 1-year-ahead inflation expectation for firm i, $E_{i,t}^{post}[\pi_{t+1}]$ is the corresponding post-treatment (posterior) inflation expectation, and $\mathbb{1}\{i \in \text{Treatment } j\}$ is an indicator variable equal to one if firm i is in treatment group $j \in \{\text{Actual inflation, Inflation forecast}\}$. As discussed in Coibion et al. (2022), the coefficients b_j measure the slope effect and correspond to the negative of the gain of the Kalman filter that respondents use to update their beliefs. Thus, one should expect $b_j \in [-1, 0]$.[13] In a similar spirit, the coefficients c_j measure the level effect of the treatment, which captures a product of the Kalman gain and the difference between the signal and the average expectation for the signal. For example, if the provided inflation forecast is below average prior expectations in the sample, the estimated level effect should be negative as respondents should lower their inflation expectations toward the provided signal. Although controls for firm characteristics may be included to improve the precision of estimates for b_j, one can consistently estimate these coefficients with OLS even without controls due to the randomization of treatments. In the baseline specification, we include only country fixed effects to absorb country-level differences in average expectations (these would correspond to country-specific level effects). Because survey data can be noisy, we use Huber (1964) robust regressions to automatically handle outliers and influential observations.

Columns (1) and (2) of Table 3 report the estimated treatment effects and Figure 5 presents the binscatter plots that correspond to specification (1). We find that the randomized information treatments move inflation expectations significantly. The treatment effects are stronger for the group provided with the inflation forecast: the estimated slope coefficient for this group is more negative than the estimated slope for the group that was provided with past inflation ($p < 0.01$). The stronger response to inflation forecasts indicates that firms are ex-ante less aware of this information compared to current inflation rates. Our findings indicate that firms form expectations subject to significant information frictions. Specifically, firms change their beliefs in response to publicly available information, consistent with Bayesian updating ($\widehat{b_j} < 0$).

[13] For the control group there is no follow-up question to measure posterior beliefs and we impose $E_{i,t}^{prior}[\pi_{t+1}] = E_{i,t}^{post}[\pi_{t+1}]$. That is, $a_1 = 1$ and $b_1 = 0$ by construction.

4.2 Heterogeneity in treatment effects

The degree of information frictions may vary both with firm-level characteristics and with aggregate variables. Weber et al. (2025) argue that economic agents pay more attention to inflation in high-inflation environments by showing that information provision has smaller effects on inflation expectations when inflation is high at the time of the treatment. To test whether there is cross-country heterogeneity in information frictions and belief updating in our sample, we estimate specification (1) separately for firms in low- and high-inflation countries and regions.

Column (3) of Table 3 shows the treatment effects for firms in Belgium, Finland, France, Greece, Ireland, and Spain, which had relatively low inflation at the time of the survey (see Table 1). Column (4) shows the treatment effects for firms in the Netherlands, Italy, Germany, Austria, Slovakia, and Portugal, which had relatively high inflation. We find that the treatment effects on inflation expectations are smaller for firms in high-inflation countries, especially for the treatment with current inflation ($p = 0.05$). This is consistent with economic agents in a high-inflation environment being more aware of publicly available information such as current inflation statistics, similar to the findings in Weber et al. (2025). The treatment effects for the inflation forecast intervention are also slightly lower for firms in high-inflation countries, but the differences are smaller and less statistically significant. We find similar results when we focus on differences in regional inflation within countries (columns (5) and (6)).

We also estimate country-specific treatment effects. Figure 6 shows the relationship between country-specific treatment effects and national inflation. Panel A shows that the estimated country-specific effects of past information treatments, as measured by the slope b_j in specification (1), become weaker as country-level inflation increases. Panel B visualizes similar (but statistically weaker) effects of the inflation forecast treatment.

4.3 Causal effects of inflation expectations

Although not the main focus of our analysis, a key question is whether and how inflation expectations translate into actions and related expectations. To shed more light on this, we exploit post-treatment variation in posterior beliefs to measure the causal effect of inflation expectations on the plans and expectations that firms have for their price setting, wages, employment, and costs over the next twelve months. In particular, we build on Coibion et al. (2022), Coibion et al. (2023), and the subsequent literature and estimate the following specification:

$$Outcome_{i,t} = \gamma_0 + \gamma_1 \widehat{E_{i,t}^{post}[\pi_{t+1}]} + \gamma_2 E_{i,t}^{prior}[\pi_{t+1}] + controls_{i,t} + error_{i,t} \tag{2}$$

where $Outcome_{i,t}$ is a variable of interest and $E_{i,t}^{post}[\pi_{t+1}]$ is instrumented using RCT variation, with the first-stage regression given by equation (1). γ_1 is the coefficient of interest that measures the total effect of changes in inflation expectations on choices. The list of controls includes firm

turnover, number of employees, firm age, as well as country and sector fixed effects. To deal with the noise in survey data, we follow the prior work: the first-stage regression is estimated with Huber (1964) robust methods and the second stage uses jackknife to identify influential observations.

We find (Panel A, Table 4) that exogenously raising inflation expectations by one percentage point increases firms' planned prices by approximately 0.3 percentage points. This is a large pass-through given that earlier studies for low-inflation environments (e.g., Coibion et al., 2020) estimate a pass-through of about 0.2. At the same time, firms expect an even larger (0.64) pass-through into costs. We find that higher inflation expectations result in plans to hire more workers: one percentage point higher inflation expectations lead to a 0.3 percentage point planned increase in employment.[14] We find that expected changes in wages are smaller than those for prices, although the wage effects become more precise when we control for firm characteristics (compare Panels A and B).[15] Overall, firms plan to act significantly on their beliefs by expecting to set higher prices and planning to hire more employees, and they expect higher wages and other costs; thus, inflation expectations matter for firms' actions.

5 Properties of firms' inflation expectations

5.1 Predictors of inflation expectations and the explanatory power of firms' location

As we have documented by means of our RCT, firms form their inflation expectations subject to significant information frictions. But what is the nature of the frictions and what shapes firms' inflation expectations? We proceed by taking a broad look at the predictors of inflation expectations. Although the previous literature (see D'Acunto et al., 2023, for a survey) has extensively studied predictors of cross-sectional variation in households' inflation expectations (such as age, gender, education, etc.), there is relatively little evidence on what accounts for similar variation across firms.[16] Fortunately, the richness of our survey allows us to provide new insights on the matter.

Figure 7 provides a sense of the bivariate relations between selected firm characteristics and inflation expectations in the form of binned scatter plots, in part using data from linking the SAFE to the Orbis database. There is a negative relationship between the size of a firm (measured by employment) and inflation expectations, which is in line with evidence from other surveys (e.g.,

[14]This result contrasts with Coibion et al. (2020) documenting that Italian firms had a stagflationary view of inflation for at least some time after the Great Recession. We interpret this result as suggesting that firms' interpretation of inflation can be state-dependent and that the current view is consistent with a demand-driven boom in the economy.

[15]The magnitude (0.15-0.17) is similar to the results reported for German firms in recent quarters (Buchheim et al., 2023) but considerably lower than for French firms before the recent spike in inflation in the euro area. The relatively moderate pass-through to wage growth is also consistent with workers expecting a low pass-through from inflation to wage growth even in a high-inflation environment (e.g., Hajdini et al., 2022).

[16]This dearth of evidence reflects the fact that surveys of firms tend to be quite short, often 5 to 10 questions, so that there is no space to gather information on managers' or firms' characteristics.

McClure et al., 2025). Older firms tend to have lower inflation expectations than young firms. Firms with higher leverage tend to be associated with higher short-term inflation expectations. This evidence is indicative of an important role of financial constraints in determining firms' inflation expectations and is in line with earlier studies. For example, Albrizio et al. (2023) find that firms relying more on external financing and thus being more exposed to interest rate risk increase their inflation expectations by more after a monetary policy hike.

To make progress in quantifying the relative contributions of various firm characteristics, we consider four blocks of variables that possibly shape inflation expectations. The first block includes firm demographics such as firm age, size, etc. The second block consists of variables describing firms' constraints and outlook such as investment plans, leverage and access to credit. The third block consists of sector fixed effects. In this context, we define sectors at the level of granular two-digit NACE industries, leveraging the match from SAFE to Orbis. The fourth block covers the role of firms' location with various levels of aggregation. In one specification, we capture firms' locations simply by their country. In the second specification, we measure firms' locations in a more granular way by considering their NUTS region. To make our analysis insensitive to the order in which variables are included, we use Shapley's (1953) classic approach to allocate R^2 across sets of potentially correlated regressors, which has a number of desirable properties (e.g., additivity of marginal R^2s).

Table 5 shows that firm demographics as well as firms' choices and constraints, i.e., the first two blocks of variables, make an important contribution (approximately 0.09) to the total R^2 for inflation expectations (see columns (1)-(4)). This is consistent with the notion that firms' attention, and hence inflation expectations, could be jointly determined with other firm decisions. For example, Gorodnichenko (2008), Alvarez et al. (2011), and others develop models where firms' decisions to acquire information depend on whether firms also plan to reset their prices. Coibion et al. (2018) document empirically that firms facing higher competition tend to have better inflation forecasts. Thus, the explanatory power of firms' choices and constraints may point to rational inattention as a potential source of cross-sectional variation.[17] We also find some role for the third block of variables, firms' two-digit NACE sectors. This is in line with Andrade et al. (2022), who report empirical evidence for the role of industry-specific conditions for French firms' inflation expectations.

However, we find that, above all, firms' location plays an outsized role in firms' euro area inflation expectations. Country fixed effects (see columns (1)-(2)) account for 60% of R^2. These large shares confirm that euro area inflation expectations of firms are strongly influenced by their own country's macroeconomic environment. When we replace country fixed effects with NUTS region fixed effects (columns (3)-(4)), the R^2 contribution of firms' locations increases further, up to a share of 65%, and increases the total R^2 to 0.33. Overall, this evidence suggests that shocks and signals even at a more local level matter for firms' euro area inflation expectations.[18]

[17] In line with this, we present evidence below suggesting that firms' incentives for information acquisition matter for how much they draw on local information to form aggregate expectations.

[18] Appendix Table A.8 shows results for three- and five-year-ahead inflation expectations, where we also find that

We find similar results for firms' perceived ECB inflation target. Columns (5)-(8) of Table 5 show that while firm demographics and their choices and constraints can account for some cross-sectional variation in firms' perceived inflation target, the country, and especially, the region in which a firm is located are the most important predictors of their perceived inflation target. Specifically, fixed effects for NUTS regions account for 57% of the R^2 (by explaining 13% of the variation in perceived inflation targets out of 19% total explained variation).

5.2 Correlation of national and euro area inflation expectations

The Lucas (1972) island model, along with subsequent research, emphasizes that economic agents can extrapolate from local conditions to predict aggregate outcomes. For example, D'Acunto et al. (2021) show that households' grocery price changes affect their inflation expectations and Andrade et al. (2022) document that aggregate inflation expectations of French firms are predicted by industry-specific idiosyncratic shocks. Given the design of our survey, which elicits both firms' euro area and national inflation expectations, we can explore if firms' predictions about national inflation are related to their predictions about euro area inflation and thus directly contribute to this research agenda. Furthermore, given that surveyed firms are located across many regions, we can test whether differences in national inflation expectations at the regional level also translate into different euro area inflation expectations.

Panel A (left) of Figure 8 shows that countries with relatively high national inflation expectations also have relatively high euro area inflation expectations. In other words, their predictions for inflation in their own country are closely related to their predictions for inflation in the whole euro area ($\rho = 0.89$). For example, Slovakian firms predict inflation in their own country to be 9.9% and inflation in the euro area to be 8.6% (as of 2023Q2), while Spanish firms predict inflation in their own country to be 4.7% and inflation in the euro area to be 4.9%. On average, a 1 p.p. higher national inflation expectation is associated with a 0.68 p.p. higher euro area inflation expectations. Thus, euro area expectations appear to be colored by national inflation expectations. Under full-information rational expectations (FIRE), however, firms in different countries should hold identical expectations for euro area inflation, implying a correlation of zero.[19]

Panel A (right) of Figure 8 further provides evidence at the regional level. For average expectations in different NUTS regions across Germany, Spain, Finland, Italy, and Portugal, we find that even in the cross-section of regions, national and euro area inflation expectations are positively correlated.[20] For example, in the Spanish region of Castile-Leon, firms' national inflation

location is an important factor.

[19]Recall that firms were asked either about euro area or national inflation expectations to avoid numerical anchoring effects. Therefore we carry these exercises out at the level of countries (and regions, below), rather than at the firm level, comparing the euro area inflation expectations elicited from one subset of firms to the national inflation expectations elicited from another subset of firms.

[20]We drop the Italian Campania region in 2023Q4 in Panel B, which has an average euro area inflation expectation of 14.1% and an average national inflation expectation of 5.0%. This does not affect the estimated regression slope.

expectations are 7.34% and their euro area inflation expectations are 5.76%, while in the region of Alicante, national inflation expectations are 4.93% and euro area inflation expectations are 4.28%. The statistical relationship is significant but weaker than in the cross-section of countries ($\rho = 0.40$), which may be partly due to smaller sample sizes at the subnational levels and measurement error in survey expectations. The presence of this pattern across regions suggests that even more localized shocks and signals – beyond the country level – play a significant role in shaping firms' inflation expectations, in line with the Lucas (1972) insight.

5.3 The link between country and regional inflation and euro area inflation expectations

In the next step, we document that *actual* inflation at the country and regional levels predict firms' euro area inflation expectations. Panel B (left) of Figure 8 plots average country-level euro area inflation expectations against actual inflation in the respective country at the time of the survey. Firms' predictions for inflation in the euro area are highly correlated with actual inflation in their own country ($\rho = 0.79$). Firms in Slovakia, where inflation is the highest, predict higher euro area inflation than firms in Spain, where inflation is relatively low. On average, in countries where national inflation is 1 p.p. higher, firms predict euro area inflation to be 0.32 p.p. higher.[21]

This pattern also holds at the level of NUTS regions ($\rho = 0.61$), see Panel B (right) of Figure 8. For example, in the Spanish region of Castile-Leon where euro area inflation expectations are 5.76%, regional inflation is 6.5%, while in the region of Alicante, where euro area inflation expectations are 4.28%, regional inflation is 5.95%. On average, firms in regions where regional inflation is 1 p.p. higher predict euro area inflation to be 0.42 p.p. higher. While the scatter plot shown here reflects to some extent also variation across country and time, the relationship between regional inflation and euro area inflation expectations also holds within countries and time periods (Panel C of Appendix Table A.9).[22]

We carry out a number of robustness checks and extensions. First, we document the relationship between regional inflation and firms' euro area inflation expectations by means of firm-level regressions, allowing us to include an extensive set of control variables. When we control for country and sector fixed effects as well as firms' demographics and their choices and constraints (Appendix Table A.11, column (2)-(4)), higher regional inflation in the firms' location is associated with higher inflation expectations even when comparing firms in the same country and operating in the same sector. Second, when we run a "horse race" regression with regional inflation vs. other regional

[21] When computing country- and region-level inflation, our baseline is a four-quarter moving average of HICP inflation, as described in detail in Section 2.6. This aims at averaging out seasonal fluctuations that do not materially affect agents' expectations and thus could attenuate our estimates. However, the takeaways from Panel B of Figure 8 are robust to using alternative bandwidths for the moving average including the unsmoothed inflation at the time of the survey (see Panel A of Appendix Table A.9).

[22] Since the number of regions within a country is between 6 and 16 (see Appendix Table A.3), including country-time fixed effects results in noisier estimates.

economic indicators (regional GDP growth and unemployment rate), we find that the main local variable affecting firms' euro area inflation expectations is indeed regional inflation (columns (1)-(3) in Appendix Table A.12).

Third, we ask if there is meaningful firm heterogeneity in the association between regional inflation and firms' euro area inflation expectations. In particular, one might expect that not all firms may utilize local signals equally strongly. Specifically, rational inattention implies that firms with larger losses from biased expectations exercise more effort in acquiring precise signals. They may thus rely less on extrapolating from national and regional inflation to forecast euro area inflation.[23] To empirically test this hypothesis, we explore whether firm-level heterogeneity in firms' export shares explain differential degrees of extrapolation from regional inflation. A firm's export share should be correlated with their exposure to aggregate shocks and thus implies that such firms should be more attentive to euro area inflation, and correspondingly extrapolate less from local inflation. Column (1) in Table 6 repeats the exercise of Panel B (right) in Figure 8 through a firm-level regression. Columns (2) and (3) then interact regional inflation with indicator variables capturing the extent to which a firm exports to other countries:

$$\begin{aligned}\mathbb{E}_{i,t}[\pi_{t+1}] = b\pi^R_{r(i),t} + \sum_k c_k \pi^R_{r(i),t} \times \mathbb{1}\{\text{Exports}_{i,t} \in \text{ range } k\} \\ + \sum_k a_{c,t,k} \times \mathbb{1}\{\text{Exports}_{i,t} \in \text{ range } k\} + error_{i,t}\end{aligned} \tag{3}$$

where $E_{i,t}[\pi_{t+1}]$ is firm i's one-year-ahead euro area inflation expectation at time t, $a_{c,t}$ is a country-time fixed effect, $\pi^R_{r(i),t}$ is regional inflation in the firm's location, $\mathbb{1}\{\text{Exports}_i \in \text{ range } k\}$ is an indicator variable capturing if firm i's export share is in a certain range, and $a_{c,t,k}$ is a country-time-export share fixed effect. Under the null hypothesis that all firms extrapolate from regional inflation to the same extent, we should have $c_k = 0$. However, we find that firms with the largest export shares (above 80%) extrapolate significantly less from regional inflation, with the group-specific slope given by $b + c_k$ dropping from around 0.5 and statistically significant at the 1% level for firms with export shares between 0% and 80% to slightly negative and statistically insignificant for firms with export shares above 80%. The result is robust to controlling for firm size and its interaction with regional inflation. This result is also robust to controlling for regional GDP growth and unemployment rates and their interaction with the indicator of a firm-level export share above 80% (Appendix Table A.11).

5.4 Regional inflation and firms' perceived inflation target

Our survey also elicits firms' perceptions about which inflation rate the ECB targets. As noted above, Table 5 (columns (5)-(8)) establishes that firms' location is the most important predictor of

[23] This is consistent with findings in Andries et al. (2025), who show that extrapolative forecasts are less prevalent among investors who possess more informative signals.

their perceived ECB inflation target. Firms' perceived inflation targets may diverge from the ECB's objective not only if firms are uninformed, but also if they believe the central bank is actually aiming for a different inflation rate. In the latter case, observed inflation is a relevant signal for the perceived inflation target.[24] To understand if realized inflation at the country and regional level is similarly important in shaping firms' perceived inflation target as it is for firms' inflation expectations, Panel C of Figure 8 compares firms' perceived inflation targets to *medium-term* average inflation, defined as an eight-quarter backward-looking average, in their location. We plot average perceived inflation targets against average inflation over the past three years, both at the country level and at the level of NUTS regions. We find that medium-run inflation both at the country and the regional level strongly correlates with firms' perceived inflation targets ($\rho = 0.53$ at the country level and $\rho = 0.56$ at the regional level). For example, the relatively high perceived inflation target of firms in Austria can be accounted for by Austria having the highest average inflation rate in the recent past, while firms in Finland perceive the ECB inflation target to be lower, in line with low average inflation over the two years before the survey. In the cross-section of regions, a one p.p. higher inflation rate over the last three years is associated with a 0.91 p.p. increase in firms' perception of the inflation target. This evidence is in line with Malmendier and Nagel (2016), who show that households' inflation expectations are shaped by lifetime inflation experiences, but extends this channel to firms' perceived inflation target. This pattern also holds considering shorter- and longer-term inflation averages, e.g., over two or four years (but not over the very short-term such as over one year or less), and is robust to using within-country variation (Appendix Table A.13). The spill-over from short- to medium-term inflation fluctuations, even at the regional level, into firms' perceived inflation target presents a fundamental challenge for central banks' communication strategies and poses risks to the anchoring of inflation expectations.

6 A Lucas island model of euro area inflation expectations

In this section, we extend the canonical Lucas (1972) island model to a monetary union. Firms are located in a given country c and region r. We focus on firms' expectation formation under imperfect information, with their objective to forecast national inflation π_c^C and euro area inflation π^U based on imperfect signals of these inflation processes as well as regional inflation in their region r, $\pi_{r,c}^R$. We will show that the island model is consistent with the empirical evidence in Section 4 and Section 5. Moreover, we show that the model also captures the reduction in firms' disagreement following the provision of additional information as in the RCT of Section 4. Finally, we will further leverage our data to empirically estimate the "pass-through" of national inflation expectations into euro area inflation expectations in a model-consistent way.

[24] As noted above, during the high-inflation period considered in this paper, it is likely that firms are relatively well informed about the central bank objective (Coibion and Gorodnichenko, 2025).

6.1 Model setup

We consider inflation at three levels of geographical aggregation: euro area (π^U), country level (π^C_c), and regional level ($\pi^R_{r,c}$). For simplicity, we omit dynamics and assume inflation at each level is driven by union-, country-, and region-specific shocks.[25] In particular, euro area, country, and regional inflation are given by

$$\pi^U = \theta^U \tag{4}$$
$$\pi^C_c = \theta^U + \theta^C_c \tag{5}$$
$$\pi^R_{r,c} = \theta^U + \theta^C_c + \theta^R_{r,c}, \tag{6}$$

where $\theta^U \overset{iid}{\sim} \mathcal{N}(0, \sigma^2_U)$, $\theta^C_c \overset{iid}{\sim} \mathcal{N}(0, \sigma^2_C)$, and $\theta^R_{r,c} \overset{iid}{\sim} \mathcal{N}(0, \sigma^2_R)$ are the unobserved fundamentals. Because the shocks are independent, $\pi^C_c \sim \mathcal{N}(0, \sigma^2_U + \sigma^2_C)$ and $\pi^R_{r,c} \sim \mathcal{N}(0, \sigma^2_U + \sigma^2_C + \sigma^2_R)$.

Firms do not observe "aggregate" euro area inflation and national inflation perfectly. Instead, firm i (in region r of country c) sees noisy signals thereof, given by

$$s^U_{i,r,c} = \pi^U + \varepsilon^U_{i,r,c} \tag{7}$$
$$s^C_{i,r,c} = \pi^C_c + \varepsilon^C_{i,r,c} \tag{8}$$

with $\varepsilon^U_{i,r,c} \overset{iid}{\sim} \mathcal{N}(0, \sigma^2_{\varepsilon,U})$ and $\varepsilon^C_{i,r,c} \overset{iid}{\sim} \mathcal{N}(0, \sigma^2_{\varepsilon,C})$. For simplicity, we assume firms observe regional inflation $\pi^R_{r,c}$ perfectly. This assumption is consistent with Andrade et al. (2022) and D'Acunto et al. (2021) documenting that economic agents are better aware of their (very) local conditions than aggregate conditions. In short, the information set of firm i located in country c and region r is given by the vector $\mathbf{s}_{i,r,c} = [s^U_{i,r,c}, s^C_{i,r,c}, \pi^R_{r,c}]'$.

Given the linearity of the model and the normally distributed shocks, firms' expectations are:

$$\mathbb{E}_{i,r,c}[\pi^U] = \gamma_U s^U_{i,r,c} + \gamma_C s^C_{i,r,c} + \gamma_R \pi^R_{r,c} \tag{9}$$
$$\mathbb{E}_{i,r,c}[\pi^C_c] = \phi_U s^U_{i,r,c} + \phi_C s^C_{i,r,c} + \phi_R \pi^R_{r,c}, \tag{10}$$

where $\mathbb{E}_{i,r,c} := \mathbb{E}[\,\cdot \mid \mathbf{s}_{i,r,c}]$ denotes the expectation of firm i in country c and region r and with the γ and ϕ parameters given by the appropriate projection coefficients, which are functions of the shock variances σ^2_U, σ^2_C, σ^2_R, $\sigma^2_{\varepsilon,U}$, and $\sigma^2_{\varepsilon,C}$ (see Appendix B.1 for the closed-form expressions).

These equations show that firms will have different expectations because they have different signals, partly due to noise and due to regional inflation differentials. Under FIRE (i.e., $\sigma_{\varepsilon,U} = \sigma_{\varepsilon,C} = 0$), all firms hold the same euro area inflation expectation.

[25] It is straightforward to show that the model mechanisms hold also with autoregressive dynamics. For example, if inflation follows an AR(1) process with known persistence, agents forecast inflation by combining their belief about current inflation based on contemporaneous signals, as in the static model, with the known autoregressive structure of inflation.

6.2 Model calibration and empirical fit

We calibrate the model as follows. First, we choose the standard deviations of inflation innovations by matching them to the empirical standard deviations of euro area inflation, as well as country and region inflation differentials, between 2018 and 2023. This yields $\sigma_U = 2.48\%$, $\sigma_C = 1.77\%$, and $\sigma_R = 0.59\%$. We calibrate the noise variances $\sigma_{\varepsilon,U}$ and $\sigma_{\varepsilon,C}$ to match as well as possible the model-implied slopes of $E_{r,c}[\pi^U]$ on $\pi^R_{r,c}$, given by $b = 0.417$, see in Panel B (right) of Figure 8, and $E_{r,c}[\pi^U]$ on π^C_c, given by $b = 0.415$. We further discipline the model by imposing $\sigma_{\varepsilon,C} \leq \sigma_{\varepsilon,U}$. This leads to $\sigma_{\varepsilon,C} = \sigma_{\varepsilon,U} = 2.04\%$.[26] Panel A of Table 7 summarizes the calibration.

The model calibration implies a large degree of noise in firms' signals for national and euro area inflation. This rationalizes the evidence in Section 4, where firms strongly adjust their expectations when presented with additional information on the euro area inflation process. We analyze the RCT through the lens of the model more explicitly below.

Panel B of Table 7 shows that the model can account for the properties of firms' euro area inflation expectations presented in Section 5. First, euro area inflation expectations are positively correlated with national inflation expectations in the cross-sections of countries and regions, consistent with Figure 8, Panel A. Second, euro area inflation expectations are positively correlated with actual inflation at the national level and at the regional level, in line with Figure 8, Panel B.

The model shows that noisy signals and regional inflation differentials can generate a substantial amount of disagreement in firms' inflation expectations. We compute disagreement as

$$\sqrt{(\gamma_U)^2\sigma^2_{\varepsilon,U} + (\gamma_C)^2(\sigma^2_C + \sigma^2_{\varepsilon,C}) + (\gamma_R)^2(\sigma^2_C + \sigma^2_R) + 2\gamma_C\gamma_R\sigma^2_C} \tag{11}$$

for euro area inflation expectations and $\sqrt{(\phi_U)^2\sigma^2_{\varepsilon,U} + (\phi_C)^2\sigma^2_{\varepsilon,C} + (\phi_R)^2\sigma^2_R}$ for national inflation expectations (within countries). The dispersion of euro area inflation expectations in the data is 3.21 percentage points. The simple calibrated model implies a disagreement in euro area inflation expectations of 1.03 percentage points, i.e., it can generate close to a third of the empirically observed disagreement. The model underpredicts the empirical dispersion due to at least two factors not captured by the model. First, firms' inflation expectations are measured with noise. This is suggested by the fact that observables can only account for a small share of the dispersion in the data, whereby disagreement in residualized expectations is similarly large (3.10 percentage points). Second, firms likely disagree in inflation expectations due to further differences in their information sets, such as firm-specific signals or characteristics of the managers that are unobserved

[26] Appendix Figure B.1 shows how the targeted moments depend on the choices of $\sigma_{\varepsilon,U}$ and $\sigma_{\varepsilon,C}$. For a given $\sigma_{\varepsilon,U}$, the slope of $E_{r,c}[\pi^U]$ on $\pi^R_{r,c}$ increases in $\sigma_{\varepsilon,C}$ because a less precise country signal increases the weight placed on regional inflation. In contrast, for a given $\sigma_{\varepsilon,U}$, the slope of $E_{r,c}[\pi^U]$ on π^C_c falls in $\sigma_{\varepsilon,C}$ because a less precise country signal decreases the weight placed on country inflation. The model prefers a very high noise variance of the country signal, because it allows attaining a strong extrapolation from regional inflation while at the same time keeping the extrapolation from the country signal limited. While a higher noise variance of the euro area signal would also increase the extrapolation from regional inflation, it would also increase the extrapolation from country-level inflation, which is, however, not supported by the data.

in our data.

As an additional untargeted moment, we examine firms' uncertainty around their euro area point forecast. The perceived conditional variance of euro area inflation given the information set is $Var(\pi^U \mid \mathbf{s}_{i,r,c}) = \sigma_U^2 - \mathbb{E}[\mathbf{s}_{i,r,c}\pi^U]'\mathbb{E}[\mathbf{s}_{i,r,c}\mathbf{s}'_{i,r,c}]^{-1}\mathbb{E}[\mathbf{s}_{i,r,c}\pi^U]$. In the calibrated model, the uncertainty in terms of standard deviation is 1.20 percentage points. In the survey data, where we elicit perceived uncertainty about 5-year-ahead inflation, the perceived standard deviation is 1.78 percentage points on average.

6.3 Pass-through of national inflation expectations into euro area inflation expectations

In the data, we observe a strong correlation between firms' national inflation expectations and their euro area inflation expectations. Through the lens of the model, expectations do not "cause" each other. Instead, expectations are jointly determined given the observed signals. At the same time, because signals are noisy, firms extrapolate from country-level signals into union-level inflation expectations. Indeed, under incomplete information of the island model, inflation expectations in country c color inflation expectations for the euro area, because firms in country c use the available local information to infer "aggregate" inflation. Specifically, one can show that

$$\mathbb{E}_{i,r,c}[\pi^U] = \beta \mathbb{E}_{i,r,c}[\pi_c^C] + \delta_U s_{i,r,c}^U, \tag{12}$$

where β and δ_U are functions of structural parameters. This equation shows that firms' euro area inflation expectations are formed by combining their beliefs about national inflation, $E_{i,r,c}[\pi_c^C]$, and the aggregate inflation signal, $s_{i,r,c}^U$ (Appendix B.1 provides the derivation).

We refer to β as the pass-through of national inflation expectations into euro area inflation expectations. This pass-through is given by

$$\beta = \frac{\gamma_R}{\phi_R} = \frac{1}{1 + \frac{\sigma_C^2}{\sigma_U^2}\left(1 + \frac{\sigma_U^2}{\sigma_{\varepsilon,U}^2}\right)}. \tag{13}$$

Under FIRE (i.e., noise in the signals converges to zero), $\beta \to 0$. If there is no independent variation at the country level (i.e., $\sigma_C = 0$), β collapses to 1 because country-level inflation becomes identical to union-level inflation.

Note that national inflation expectations $E_{i,r,c}[\pi_c^C]$ are correlated with the signal about union-level inflation $s_{i,r,c}^U$. While firms observe $s_{i,r,c}^U$, we do not observe these signals. Hence, if we interpret (12) as a regression specification, $s_{i,r,c}^U$ is a residual and OLS cannot consistently estimate β. However, equation (13) suggests a way to recover the pass-through coefficient.

If we were able to control for union- and country-level signals, we could estimate equations (9) and (10) to identify γ_R and ϕ_R because by definition $\pi_{i,r,c}^R$ is uncorrelated with signal noise and

union- and country-level fundamentals. Although we do not observe the signals, we can control for them by using country fixed effects. Once we estimate γ_R and ϕ_R, we can estimate $\hat{\beta} = \hat{\gamma}_R/\hat{\phi}_R$. Furthermore, one can do the estimation in one step by running an instrumental variable regression where the first stage is

$$\mathbb{E}_{r,c,t}[\pi^C_{c,t+1}] = a_{c,t} + b\pi^R_{r,c,t} + error_{r,c,t} \tag{14}$$

and the second stage is

$$\mathbb{E}_{r,c,t}[\pi^U_{t+1}] = \alpha_{c,t} + \beta \widehat{E_{r,c,t}[\pi^C_{c,t+1}]} + error_{r,c,t}. \tag{15}$$

We adapt our empirical specification to the setup of our survey, in which firms are asked about either euro area or national inflation expectations. Hence, we specify (14) and (15) at the level of regions and use region-time-specific average expectations to estimate β.[27] Including country-time fixed effects implies that our estimates capture the pass-through of national inflation expectations to euro area expectations that is generated by variation in regional inflation differentials, rather than country-specific shocks. It thus speaks directly to the mechanism in the model and our empirical evidence that firms extrapolate from regional signals to "aggregate" expectations.

As shown in Table 8, the estimated pass-through of national inflation expectations into euro area inflation expectations is $\widehat{\beta} = 0.31$. That is, a 1 p.p. higher national inflation expectation, generated by higher regional inflation, leads to a 0.31 p.p. higher euro area inflation expectation. Our simple calibrated model can account for this significant pass-through and predicts $\beta = 0.44$.

6.4 The effects of information provision

The RCT in Section 4 shows that firms strongly adjust their expectations when presented with additional information on the euro area inflation. To mimic an RCT in the model, we extend the baseline model with an additional signal about euro area inflation, $s^*_{i,c,r} = \theta^U + \varepsilon^*_{i,c,r}$ with individual processing noise $\varepsilon^*_{i,c,r} \overset{iid}{\sim} \mathcal{N}(0, \sigma^2_*)$. The information set $\mathbf{s}^*_{i,r,c} = [s^U_{i,r,c}, s^C_{i,r,c}, \pi^R_{r,c}, s^*_{i,r,c}]'$ gives rise to the "posterior beliefs", while the firm's information set before the "treatment" ($\mathbf{s}_{i,r,c}$ above) generates the "prior beliefs". To motivate this approach, we note that the incomplete adjustment of firms' expectations to the provided signal in the RCT implies that they perceive these signals as noisy. Indeed, in this setup, only firm-specific noise shocks $\varepsilon^*_{i,c,r}$ can rationalize that firms with similar priors adjust posteriors differently.[28]

Letting $\mathbb{E}^*_{i,r,c}$ be the expectation of a firm after having received the additional signal, i.e., their

[27] As in Section 5, we use a four-quarter backward-looking moving average for $\pi^R_{r,c,t}$. Panel A of Appendix Table A.10 shows that the results are qualitatively robust to alternative bandwidths. Because we estimate a 2SLS specification with few observations, estimates are imprecise. To reduce noise, we estimate a specification where we average across survey rounds, which yields statistically significant estimates, see Panel B of Appendix Table A.10.

[28] More details on the extended model are provided in Appendix B.3.

"posterior belief", and $\mathbb{E}_{i,r,c}$ from the baseline model be their "prior belief", we can compute a model-implied treatment effect

$$b = -\left(1 - \frac{Cov(\mathbb{E}^*_{i,r,c}[\pi^U], \mathbb{E}_{i,r,c}[\pi^U])}{Var(\mathbb{E}_{i,r,c}[\pi^U])}\right), \tag{16}$$

which maps into the coefficients b_j in the empirical specification (1). Given the empirical treatment effect of providing the inflation forecast on euro area inflation expectations is $\hat{b}_2 = -0.53$, the model requires the standard deviation of the noise in the "RCT" information to be $\sigma_* = 1.14\%$, i.e., significantly lower than the noise of the signals that agents have at their disposal prior to the information provision.[29] Furthermore, the model captures that providing agents with additional information with relatively low noise reduces the disagreement about euro area inflation. In the model, comparing prior to posterior beliefs, disagreement falls by 23%, compared to a reduction of 23% in the data.

7 Conclusion

This paper provides new evidence on firms' inflation expectations in a heterogeneous monetary union. Using novel euro area survey data from the SAFE, covering firms' euro area and national inflation expectations and including a randomized controlled trial, we establish that firms form their inflation expectations consistent with rational Bayesian updating under incomplete information. We document that firms' geographic location plays a dominant role in shaping their inflation expectations. Specifically, firms extrapolate from regional inflation rates to form expectations about euro area inflation. We show that a higher regional inflation rate in a firm's location is associated with higher euro area inflation expectations, even within countries. This extrapolation is weaker for firms more exposed to union-level conditions, consistent with rational inattention. We also find that medium-term regional inflation outcomes shape firms' perceptions of the ECB's inflation target, suggesting that prolonged inflation differentials may pose a risk to the anchoring of inflation expectations.

We develop a Lucas island model calibrated to euro area data that accounts for these empirical patterns. The model accounts for several untargeted moments in the data, such as the correlation between national and euro area inflation expectations, a sizable share of observed disagreement across firms, and the observed response to information treatments in our RCT. We establish that there is a structural "pass-through" from national to euro area inflation expectations. Using a model-consistent 2SLS estimator, we empirically estimate that a 1 p.p. higher inflation expectation at the national level raises euro area inflation expectations by 0.3 p.p. The model can also account for changes in cross-sectional disagreement in response to information treatments.

[29] Appendix Table B.1 shows how firms adjust the weights on their signals when the new information arrives.

Our findings highlight challenges for monetary policy in monetary unions. The important role of local conditions in shaping aggregate expectations implies that regional inflation differentials can have persistent effects on firms' beliefs about euro area inflation, and even their perceptions of the central bank's objectives. This suggests that effective communication strategies should take into account that firms view aggregate economic conditions through the lens of local conditions.

References

Abberger, K., A. K. Funk, M. Lamla, S. Lein, and S. Siegrist (2024): "The pass-through of inflation expectations into prices and wages: Evidence from an RCT survey," *CEPR Discussion Papers*, DP19595.

Albrizio, S., A. G. Dizioli, and P. V. Simon (2023): "Mining the Gap: Extracting Firms' Inflation Expectations From Earnings Calls," *IMF Working Paper*, WP/23/202.

Alvarez, F., F. Lippi, and L. Paciello (2011): "Optimal Price Setting With Observation and Menu Costs," *Quarterly Journal of Economics*, 126, 1909–1960.

Andrade, P., O. Coibion, E. Gautier, and Y. Gorodnichenko (2022): "No Firm Is an Island? How Industry Conditions Shape Firms' Aggregate Expectations," *Journal of Monetary Economics*, 125, 40–56.

Andries, M., M. Bianchi, K. K. Huynh, and S. Pouget (2025): "Return Predictability, Expectations, and Investment: Experimental Evidence," *The Review of Financial Studies*, 38, 1687–1729.

Baumann, U., A. Ferrando, D. Georgarakos, Y. Gorodnichenko, and T. Reinelt (2025): "Do inflation expectations become more anchored during a disinflation episode? Evidence for euro area firms," *AEA Papers and Proceedings*, 115, 266–270.

Buchheim, L., S. Link, and S. Möhrle (2023): "Wage Expectations of Firms and Employees," Mimeo TU Dortmund.

Candia, B., O. Coibion, and Y. Gorodnichenko (2023): "The Macroeconomic Expectations of Firms," in *Handbook of Economic Expectations*, ed. by R. Bachmann, G. Topa, and W. van der Klaauw, Academic Press, 321–353.

——— (2024): "The Inflation Expectations of U.S. Firms: Evidence from a New Survey," *Journal of Monetary Economics*, 145.

Cavallo, A., G. Cruces, and R. Perez-Truglia (2017): "Inflation expectations, learning, and supermarket prices: Evidence from survey experiments," *American Economic Journal: Macroeconomics*, 9, 1–35.

Coibion, O., D. Georgarakos, Y. Gorodnichenko, and M. van Rooij (2023): "How Does Consumption Respond to News about Inflation? Field Evidence from a Randomized Control Trial," *American Economic Journal: Macroeconomics*, 15, 109–152.

Coibion, O. and Y. Gorodnichenko (2025): "Inflation, Expectations and Monetary Policy: What Have We Learned and to What End?" *NBER Working Paper*, 33858.

——— (2026): *Expectations Matter: The New Causal Macroeconomics of Surveys and Experiments*, Princeton University Press.

Coibion, O., Y. Gorodnichenko, and S. Kumar (2018): "How Do Firms Form Their Expectations? New Survey Evidence," *American Economic Review*, 108, 2671–2713.

Coibion, O., Y. Gorodnichenko, S. Kumar, and J. Ryngaert (2021): "Do You Know that I Know that You Know...? Higher-Order Beliefs in Survey Data," *Quarterly Journal of Economics*, 136, 1387–1446.

Coibion, O., Y. Gorodnichenko, and T. Ropele (2020): "Inflation Expectations and Firm Decisions: New Causal Evidence," *Quarterly Journal of Economics*, 135, 165–219.

Coibion, O., Y. Gorodnichenko, and M. Weber (2022): "Monetary Policy Communications and Their Effects on Household Inflation Expectations," *Journal of Political Economy*, 130, 1537–1584.

D'Acunto, F., U. Malmendier, J. Ospina, and M. Weber (2021): "Exposure to Grocery Prices and Inflation Expectations," *Journal of Political Economy*, 129, 1615–1639.

D'Acunto, F., U. Malmendier, and M. Weber (2023): "What do the data tell us about inflation expectations?" in *Handbook of Economic Expectations*, ed. by R. Bachmann, G. Topa, and W. van der Klaauw, Academic Press, 133–161.

Draeger, L., M. J. Lamla, and D. Pfajfar (2024): "How to limit the spillover from an inflation surge to inflation expectations?" *Journal of Monetary Economics*, 144, 103546.

European Central Bank (2023): "The ECB Survey of Professional Forecasters – Second quarter of 2023," available at https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/html/index.en.html.

Fuster, A., R. Perez-Truglia, M. Wiederholt, and B. Zafar (2022): "Expectations with endogenous information acquisition: An experimental investigation," *Review of Economics and Statistics*, 104, 1059–1078.

Georgarakos, D. and G. Kenny (2022): "Household spending and fiscal support during the COVID-19 pandemic: Insights from a new consumer survey," *Journal of Monetary Economics*, 129, 1–14.

Gorodnichenko, Y. (2008): "Endogenous information, menu costs and inflation persistence," *NBER Working Paper*, 14184.

Hajdini, I., E. Knotek, J. Leer, M. Pedemonte, R. Rich, and R. Schoenle (2022): "Low Passthrough from Inflation Expectations to Income Growth Expectations: Why People Dislike Inflation," *Federal Reserve Bank of Cleveland Working Paper*, 22–21R.

Huber, P. J. (1964): "Robust Estimation of a Location Parameter," *Annals of Mathematical Statistics*, 35, 73–101.

Kumar, S., H. Afrouzi, O. Coibion, and Y. Gorodnichenko (2015): "Inflation Targeting Does Not Anchor Inflation Expectations: Evidence from Firms in New Zealand," *Brookings Papers on Economic Activity*, 46, 151–225.

Kumar, S., Y. Gorodnichenko, and O. Coibion (2023): "The Effect of Macroeconomic Uncertainty on Firm Decisions," *Econometrica*, 91, 1297–1332.

Lindemann, C. (2025): "Households' Inflation Expectations and their Consumption Basket," Mimeo Goethe University Frankfurt.

Link, S., A. Peichl, O. Pfäuti, C. Roth, and J. Wohlfart (2025): "Attention to the Macroeconomy," *CESifo Working Paper*.

Link, S., A. Peichl, C. Roth, and J. Wohlfart (2023): "Information frictions among firms and households," *Journal of Monetary Economics*, 135, 99–115.

Lorenzoni, G. (2009): "A theory of demand shocks," *American Economic Review*, 99, 2050–2084.

Lucas, R. E. (1972): "Expectations and the Neutrality of Money," *Journal of Economic Theory*, 4, 103–124.

Malmendier, U. and S. Nagel (2016): "Learning from inflation experiences," *Quarterly Journal of Economics*, 131, 53–87.

McClure, E. M. L., V. Yaremko, O. Coibion, and Y. Gorodnichenko (2025): "The Macroeconomic Expectations of U.S. Managers," *Journal of Money, Credit and Banking*, 57, 683–716.

Pfäuti, O. (2025): "The Inflation Attention Threshold and Inflation Surges," Mimeo.

Sargent, T. J. (2008): "Evolution and intelligent design," *American Economic Review*, 98, 5–37.

Savignac, F., E. Gautier, Y. Gorodnichenko, and O. Coibion (2024): "Firms' Inflation Expectations: New Evidence from France," *Journal of the European Economic Association*, 22, 2748–2781.

Shapley, L. S. (1953): "A Value for n-Person Games," in *The Shapley Value: Essays in Honor of Lloyd S. Shapley*, ed. by A. E. Roth, Cambridge: Cambridge University Press, reprinted in Roth (ed.), *The Shapley Value*.

Sims, C. A. (2003): "Implications of Rational Inattention," *Journal of Monetary Economics*, 50, 665–690.

Weber, M., B. Candia, H. Afrouzi, T. Ropele, R. Lluberas, S. Frache, B. Meyer, S. Kumar, Y. Gorodnichenko, D. Georgarakos, O. Coibion, and G. Kenny (2025): "Tell Me Something I Don't Already Know: Learning in Low- and High-Inflation Settings," *Econometrica*, 93, 229–264.

Table 1: Descriptive statistics for firms' inflation expectations and perceived inflation target (in %)

		Actual inflation	Euro area inflation expectation			National inflation expectation			Perceived euro area inflation target		
			Mean	Median	Std	Mean	Median	Std	Mean	Median	Std
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Euro area averages											
Euro area	2023q2	6.0	5.83	5.00	2.95	5.84	5.00	2.73			
	2023q4	2.8	5.04	4.00	3.60	5.03	4.50	3.40			
	2024q4	2.2	3.48	3.00	2.71				2.80	2.00	2.76
Panel B: Country averages											
Austria	2023q2	8.3	6.94	6.50	3.03	6.70	6.00	2.80			
	2023q4	5.0	5.62	5.00	2.63	5.71	5.00	2.60			
	2024q4	1.9	3.31	3.00	2.15				3.23	2.00	3.35
Belgium	2023q2	2.4	5.16	5.00	3.25	4.58	4.00	1.94			
	2023q4	-0.8	4.62	4.00	3.51	5.24	4.00	5.32			
	2024q4	4.4	3.96	3.00	2.73				3.06	2.00	3.50
Germany	2023q2	6.7	6.11	5.70	2.45	6.18	6.00	2.04			
	2023q4	3.1	4.98	4.00	3.47	5.27	5.00	2.80			
	2024q4	2.3	3.63	3.00	2.51				3.16	2.00	3.30
Spain	2023q2	3.0	4.88	4.00	3.26	4.71	4.00	2.60			
	2023q4	3.4	4.46	3.80	3.57	5.16	4.00	3.26			
	2024q4	2.3	3.06	3.00	2.13				2.34	2.00	1.70
Finland	2023q2	5.0	4.98	5.00	2.34	4.61	4.60	1.96			
	2023q4	1.4	3.80	3.50	2.14	3.81	3.40	1.52			
	2024q4	1.6	2.76	2.00	2.09				2.10	2.00	1.44
France	2023q2	5.8	5.31	5.00	3.02	5.85	5.00	3.14			
	2023q4	3.9	5.05	4.00	3.46	5.31	5.00	4.87			
	2024q4	1.6	3.32	2.50	3.32				2.76	2.00	3.02
Greece	2023q2	3.7	6.45	5.00	3.89	6.26	5.50	3.64			
	2023q4	3.3	5.98	5.00	4.84	5.89	4.50	5.00			
	2024q4	2.9	4.05	3.00	3.78				3.29	2.00	4.26
Ireland	2023q2	5.4	5.38	5.00	2.61	6.28	6.00	4.34			
	2023q4	3.2	5.02	5.00	3.70	4.61	5.00	2.22			
	2024q4	0.6	3.02	2.50	2.64				2.46	2.00	1.18
Italy	2023q2	7.5	6.45	6.00	3.45	6.08	5.60	2.81			
	2023q4	1.0	5.59	5.00	4.54	4.55	4.00	2.70			
	2024q4	1.3	3.13	2.50	2.55				2.38	2.00	1.68
Netherlands	2023q2	6.1	5.74	5.00	2.27	5.50	5.00	2.87			
	2023q4	0.5	5.59	5.00	3.21	4.64	4.50	2.37			
	2024q4	3.7	4.38	4.00	2.83				2.77	2.00	2.10
Portugal	2023q2	5.6	5.13	5.00	2.33	4.90	5.00	2.60			
	2023q4	2.5	4.39	3.50	3.68	4.40	3.50	3.41			
	2024q4	2.8	3.04	2.50	1.99				2.23	2.00	1.12
Slovakia	2023q2	11.5	8.55	9.00	4.11	9.91	10.00	3.78			
	2023q4	6.7	6.86	6.00	3.34	8.25	7.00	4.67			
	2024q4	3.5	4.98	4.00	3.48				2.73	2.00	1.44
Panel C. Memorandum for euro area											
Households (CES)	2023q2					5.73	4.61	5.88			
	2023q4					5.55	3.99	5.76			
	2024q4					4.32	2.75	4.95	3.68	2.06	6.54
Professional forecasters (SPF)	2023q2		2.81	2.75	1.06						
	2023q4		2.48	2.50	0.51						
	2024q4		1.95	2.00	0.30						

Notes: Column (1) shows inflation in the quarter of the survey. The statistics in columns (2)-(7) are based on pre-treatment responses for 2023Q2 and control group responses for 2023Q4 and 2024Q4. Inflation expectations and perceived inflation targets are trimmed at -1% and 30%.

Table 2: Uncertainty in 5-year-ahead inflation expectations (in %)

		Actual	Point forecast		CV		Std		Lower tail		Upper tail	
		inflation	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A: Euro area inflation												
Euro area	2023q2	6.0	4.83	4.99	0.33	0.12	1.52	1.66	16.64	18.05	33.26	21.02
	2023q4	2.8	5.91	6.44	0.35	0.11	2.04	2.42	17.75	19.44	35.79	21.95
Austria	2023q2	8.3	4.52	4.76	0.33	0.12	1.33	1.41	15.30	16.19	34.32	21.87
	2023q4	5.0	6.51	6.81	0.35	0.10	2.28	2.51	16.41	18.74	37.31	20.06
Belgium	2023q2	2.4	6.11	5.94	0.28	0.12	1.71	1.90	11.85	15.54	24.95	18.69
	2023q4	-0.8	7.88	7.19	0.35	0.11	2.75	2.67	21.44	22.53	34.04	23.31
Germany	2023q2	6.7	4.91	4.84	0.33	0.12	1.59	1.78	15.35	17.26	34.41	21.68
	2023q4	3.1	6.27	6.85	0.34	0.10	2.14	2.59	16.08	18.27	35.30	21.03
Spain	2023q2	3.0	3.56	3.62	0.33	0.11	1.18	1.23	17.26	19.20	32.05	21.17
	2023q4	3.4	4.22	4.50	0.34	0.11	1.45	1.70	17.73	18.47	35.20	23.02
Finland	2023q2	5.0	3.59	3.88	0.39	0.10	1.24	1.42	26.43	19.84	37.00	17.12
	2023q4	1.4	3.53	3.68	0.37	0.10	1.26	1.34	22.34	18.80	36.14	18.57
France	2023q2	5.8	5.46	5.67	0.35	0.09	1.62	1.69	16.01	16.07	35.01	20.41
	2023q4	3.9	5.88	5.96	0.36	0.11	2.05	2.26	19.57	20.09	38.74	23.54
Greece	2023q2	3.7	4.77	4.47	0.34	0.14	1.64	1.80	21.52	21.26	32.72	22.63
	2023q4	3.3	4.56	5.55	0.42	0.09	1.68	1.96	39.74	28.41	29.12	20.83
Ireland	2023q2	5.4	4.44	4.26	0.31	0.10	1.29	1.10	12.61	13.76	30.88	20.29
	2023q4	3.2	6.47	7.32	0.37	0.10	2.41	2.94	18.89	19.48	38.62	21.17
Italy	2023q2	7.5	4.72	4.90	0.33	0.13	1.57	1.71	18.80	19.80	31.70	20.62
	2023q4	1.0	4.65	5.57	0.36	0.10	1.71	2.04	17.92	16.97	37.69	20.94
Netherlands	2023q2	6.1	6.16	6.34	0.33	0.11	1.82	1.90	18.08	20.20	30.22	18.34
	2023q4	0.5	9.59	7.73	0.32	0.11	3.18	3.00	16.73	22.29	30.01	20.55
Portugal	2023q2	5.6	2.98	3.08	0.34	0.12	0.92	0.65	19.89	18.65	32.74	20.57
	2023q4	2.5	3.26	4.34	0.32	0.12	0.92	1.09	15.13	20.93	35.15	24.94
Slovakia	2023q2	11.5	6.18	6.25	0.37	0.11	1.80	1.82	20.54	20.60	37.81	23.42
	2023q4	6.7	7.50	8.47	0.37	0.11	2.74	3.47	19.99	20.37	39.28	21.61
Panel B: National inflation												
Austria	2023q2	8.3	4.57	4.92	0.32	0.10	1.42	1.72	13.19	12.10	30.44	17.78
Belgium	2023q2	2.4	4.52	5.51	0.30	0.12	1.34	1.97	9.85	12.90	30.81	21.24
Germany	2023q2	6.7	5.67	5.22	0.35	0.12	2.02	2.16	16.79	18.72	36.68	20.24
Spain	2023q2	3.0	3.82	5.36	0.34	0.11	1.27	1.97	18.54	19.10	33.77	19.85
Finland	2023q2	5.0	3.45	3.33	0.39	0.07	1.07	0.91	23.53	18.19	37.34	13.77
France	2023q2	5.8	5.76	6.11	0.36	0.10	2.11	2.16	15.34	15.05	39.72	21.99
Greece	2023q2	3.7	4.32	5.08	0.36	0.13	1.36	1.51	20.48	23.06	39.46	28.74
Ireland	2023q2	5.4	5.43	4.58	0.31	0.12	1.64	1.47	13.54	13.64	30.54	18.85
Italy	2023q2	7.5	4.04	3.72	0.33	0.13	1.38	1.56	16.56	21.86	30.51	24.67
Netherlands	2023q2	6.1	5.62	6.30	0.31	0.11	1.70	2.06	15.95	19.28	28.13	19.29
Portugal	2023q2	5.6	2.68	2.45	0.35	0.12	1.01	1.28	20.49	19.41	34.70	18.74
Slovakia	2023q2	11.5	8.21	8.79	0.29	0.15	1.95	2.86	12.97	16.09	30.79	19.86

Notes: The table reports average and standard deviation (std) for various measures of uncertainty in inflation forecasts at the 5-year-ahead horizon. Column (1) shows inflation in the quarter of the survey. Columns (2) and (3) report statistics on the 5-year-ahead point estimate. Columns (4) and (5) report statistics for the coefficient of variation implied by the reported subjective probability distributions. Columns (6) and (7) report statistics for the standard deviation. Columns (8) and (9) report results for the probability assigned to the scenario where inflation is below 0.5×(point prediction). Columns (10) and (11) report results for the probability assigned to the scenario where inflation is above 1.5×(point prediction). Panel A shows results for euro area inflation expectations. Panel B shows results for national inflation expectations. This table covers only firms in the control group.

Table 3: Treatment effects on euro area inflation expectations

	Posterior euro area inflation expectation					
	OLS	Huber				
	(1)	(2)	(3)	(4)	(5)	(6)
	All countries		Low-inflation countries	High-inflation countries	Low-inflation regions	High-inflation regions
Treatment=Realized	3.14***	1.31***	1.87***	1.36***	1.83***	1.35***
	(0.32)	(0.09)	(0.16)	(0.12)	(0.21)	(0.25)
Treatment=Forecast	2.45***	1.71***	1.71***	1.81***	1.68***	1.50***
	(0.31)	(0.09)	(0.11)	(0.15)	(0.18)	(0.26)
Prior	1.00	1.00	1.00	1.00	1.00	1.00
Treatment=Realized × Prior	-0.49***	-0.21***	-0.31***	-0.24***	-0.30***	-0.22***
	(0.05)	(0.02)	(0.03)	(0.02)	(0.04)	(0.05)
Treatment=Forecast × Prior	-0.63***	-0.53***	-0.55***	-0.51***	-0.50***	-0.47***
	(0.06)	(0.02)	(0.03)	(0.03)	(0.04)	(0.05)
Observations	2917	2828	1403	1451	608	524
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
p-value: coefficient on (Treatment=Realized × Prior) equal to coefficient on (Treatment=Forecast × Prior)	0.08	0.00				
p-value: coefficient on (Treatment=Realized × Prior) equal to coefficient in low-inflation group				0.05		0.16
p-value: coefficient on (Treatment=Forecast × Prior) equal to coefficient in low-inflation group				0.29		0.65

Notes: The table reports estimates of specification (1). Column (1) reports OLS estimates. Columns (2)-(7) report Huber robust estimates. By construction of the posterior for the control group, the coefficient on the prior for the control group is equal to 1. Low-inflation countries in column (3) are Belgium, Finland, France, Greece, Ireland, and Spain. High-inflation countries in column (4) are the Netherlands, Italy, Germany, Austria, Slovakia, and Portugal. Low-inflation (high-inflation) regions in column (5) (column (6)) are regions in Germany, Spain, Finland, Italy, and Portugal, where regional inflation is below (above) the country-specific mean. Heteroskedasticity-robust standard errors are reported in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table 4: Causal effects of inflation expectations on firms' plans

	Change in:			
	Prices	Costs	Wages	Employment
	(1)	(2)	(3)	(4)
Panel A: No controls				
Posterior $E_{i,t}^{\text{post}}\pi_{t+1}$	0.39**	0.67***	0.15	0.34*
	(0.17)	(0.17)	(0.09)	(0.20)
Observations	2680	2724	2701	2608
R^2	0.056	0.085	0.115	0.017
1st-stage F-statistic	341.95	336.22	332.76	304.20
Panel B: Controls included				
Posterior $E_{i,t}^{\text{post}}\pi_{t+1}$	0.32**	0.62***	0.17*	0.34*
	(0.16)	(0.17)	(0.09)	(0.20)
Observations	2679	2726	2701	2609
R^2	0.096	0.113	0.144	0.037
1st-stage F-statistic	332.71	337.45	336.34	304.53
Panel C: Realized inflation treatment only, no controls				
Posterior $E_{i,t}^{\text{post}}\pi_{t+1}$	0.30	-0.47	-0.059	-0.25
	(0.67)	(0.70)	(0.38)	(0.82)
Observations	1817	1851	1838	1772
R^2	0.053	0.088	0.115	0.015
1st-stage F-statistic	99.58	97.57	95.32	95.25
Panel D: Inflation forecast treatment only, no controls				
Posterior $E_{i,t}^{\text{post}}\pi_{t+1}$	0.47**	0.90***	0.29***	0.30
	(0.18)	(0.18)	(0.10)	(0.22)
Observations	1829	1859	1846	1776
R^2	0.069	0.098	0.131	0.021
1st-stage F-statistic	579.14	569.49	564.14	512.91

Notes: The table reports estimates of coefficient γ_1 in specification (2). The first stage regression is given by specification (1). Influential observations are removed as in Coibion et al. (2022). In Panel B, firm age, sector, turnover, and employment are included as controls. Panel C is restricted to the control group and the treatment group where firms are informed about realized inflation. Panel D is restricted to the control group and the treatment group where firms are informed about an inflation forecast. Country fixed effects are included but not reported. Heteroskedasticity-robust standard errors are reported in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table 5: Shapley decomposition of R^2

	Euro area inflation expectation				Perceived inflation target			
	Country FEs		Region FEs		Country FEs		Region FEs	
	contrib.	share	contrib.	share	contrib.	share	contrib.	share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Demographics of firms	0.0445	0.16	0.0443	0.13	0.0186	0.16	0.0187	0.08
Firms' choices and constraints	0.0439	0.16	0.0441	0.13	0.0357	0.32	0.0397	0.16
Sector fixed effects	0.0226	0.08	0.0270	0.08	0.0340	0.30	0.0466	0.19
Country fixed effects	0.1659	0.60	—	—	0.0244	0.22	—	—
Region fixed effects	—	—	0.2165	0.65	—	—	0.1396	0.57
Total	0.2769	1	0.3320	1	0.1127	1	0.2446	1

Notes: The table reports Shapley (1953) decomposition of R^2 for blocks of variables. Demographics of firms includes age, turnover, subsidiary status, location of parent company, main firm owner, export share and employment. Firm's choices and constraints includes variables capturing firm-level and aggregate outlook, as well as financial conditions. Shapley decompositions of inflation expectations are reported for 2023Q2. Columns (1)-(2) and (5)-(6) include country fixed effects, while columns (3)-(4) and (7)-(8) include region fixed effects (at the level of NUTS-2 regions for all countries except Germany where they are based on NUTS-1 regions). Columns (1), (3), (5), and (7) report the marginal R^2 for a given block of variables. Columns (2), (4), (6), and (8) report the share in total R^2 reported in the bottom row. All columns use only firms for which NUTS regions are known.

Table 6: Firm-level heterogeneity in the relationship between euro area inflation expectations and realized inflation

	Euro area inflation expectation						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Regional inflation	0.508***	0.553***	0.540***	0.503***	0.483***	0.738***	0.667***
	(0.0956)	(0.109)	(0.0963)	(0.124)	(0.104)	(0.231)	(0.227)
20-39% Exports × Regional inflation		0.0164		-0.0305		-0.0136	
		(0.370)		(0.422)		(0.444)	
40-59% Exports × Regional inflation		-0.577		-0.602		-0.538	
		(0.447)		(0.475)		(0.479)	
60-79% Exports × Regional inflation		-0.163		-0.208		-0.171	
		(0.315)		(0.328)		(0.319)	
≥80% Exports × Regional inflation		-0.652**		-0.616**		-0.644**	
		(0.249)		(0.238)		(0.252)	
≥80% Exports × Regional inflation			-0.639***		-0.617***		-0.667***
			(0.239)		(0.229)		(0.229)
Constant	1.613***	1.897***	1.676***	2.245***	2.020***	2.204***	1.972***
	(0.596)	(0.636)	(0.580)	(0.673)	(0.633)	(0.687)	(0.646)
Observations	2323	2205	2323	2178	2288	2178	2288
R^2	0.228	0.239	0.232	0.261	0.253	0.262	0.255
Country × time FE	Yes						
Country × time × export group FE		Yes	Yes	Yes	Yes	Yes	Yes
Country × time × size group FE				Yes	Yes	Yes	Yes
Size group × Regional inflation						Yes	Yes

Notes: Regional inflation is measured by four-quarter backward-looking moving averages. Huber weights from regression (1) are applied. Standard errors clustered by regions in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table 7: Model calibration and fit

Panel A: Calibrated parameters

Parameter	Value	Target
Externally calibrated		
σ_U	2.48%	Std. dev. of euro area inflation
σ_C	1.77%	Std. dev. of national inflation (relative to euro area inflation)
σ_R	0.59%	Std. dev. of regional inflation (relative to national inflation)
Internally calibrated		
$\sigma_{\varepsilon,U}$	2.04%	Slopes of $\mathbb{E}_{r,c}[\pi^U]$ on $\pi^R_{r,c}$ and $\mathbb{E}_{r,c}[\pi^U]$ on π^C_c
$\sigma_{\varepsilon,C}$	2.04%	
σ_*	1.14%	Treatment effect on beliefs of -0.53

Panel B: Model fit

Moment	Data		Model
Cross-region slope $\mathbb{E}_{r,c}[\pi^U]$ on $\pi^R_{r,c}$ *(targeted)*	0.42		0.41
Cross-region slope $\mathbb{E}_{r,c}[\pi^U]$ on π^C_c *(targeted)*	0.42		0.42
Cross-region slope $\mathbb{E}_{r,c}[\pi^U]$ on $\mathbb{E}_{r,c}[\pi^C_c]$	0.20		0.44
Cross-country slope $\mathbb{E}_c[\pi^U]$ on π^C_c	0.32		0.42
Cross-country slope $\mathbb{E}_c[\pi^U]$ on $\mathbb{E}_c[\pi^C_c]$	0.68		0.44
	full	resid.	
Disagreement in $\mathbb{E}_{i,r,c}[\pi^U]$	3.21%	3.10%	1.03%
Disagreement in $\mathbb{E}_{i,r,c}[\pi^C_c]$ (within countries)	2.44%	2.35%	0.54%
Perceived uncertainty (std.) around point forecast $\mathbb{E}_{i,r,c}[\pi^U]$	1.78%[a]		1.20%
Structural pass-through from national to EA expectations β	0.31		0.44
Relative reduction in disagreement due to info provision	23%		23%

Notes: $\sigma_{\varepsilon,U}$ and $\sigma_{\varepsilon,C}$ are calibrated to minimize the sum of squared distances between the model-implied moments and the corresponding empirical moments, subject to the constraint $\sigma_{\varepsilon,C} \leq \sigma_{\varepsilon,U}$. *full* indicates total disagreement in inflation expectations in the data, while *resid.* refers to disagreement in inflation expectations residualized based on firm age, sector, turnover, employment, and country fixed effects. [a]: uncertainty in the data is observed for 5-year-ahead beliefs and the standard deviation shown here is the average observed over 2023Q2 and 2023Q4, see Table 2. Relative reduction in disagreement refers to prior and posterior (non-residualized) euro area inflation expectations $\mathbb{E}_{i,r,c}[\pi^U]$, see Appendix Table B.1 for details.

Table 8: Effect of national on euro area expectations

	Euro area inflation expectation		
	Red. form	IV	OLS
	(1)	(2)	(3)
Regional inflation	0.432**		
	(0.204)		
National inflation expectation		0.311**	0.0926*
		(0.141)	(0.0512)
Observations	86	86	86
Country × time FE	Yes	Yes	Yes
AR Wald test p-value		0.024	

Notes: This table reports results from specifications (14) and (15) in columns (1) and (2), and the corresponding OLS specification in column (3). Regional inflation is measured by four-quarter backward-looking moving averages. Huber weights from regression (1) are applied. Heteroskedasticity-robust standard errors in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Figure 1: Structure of the survey

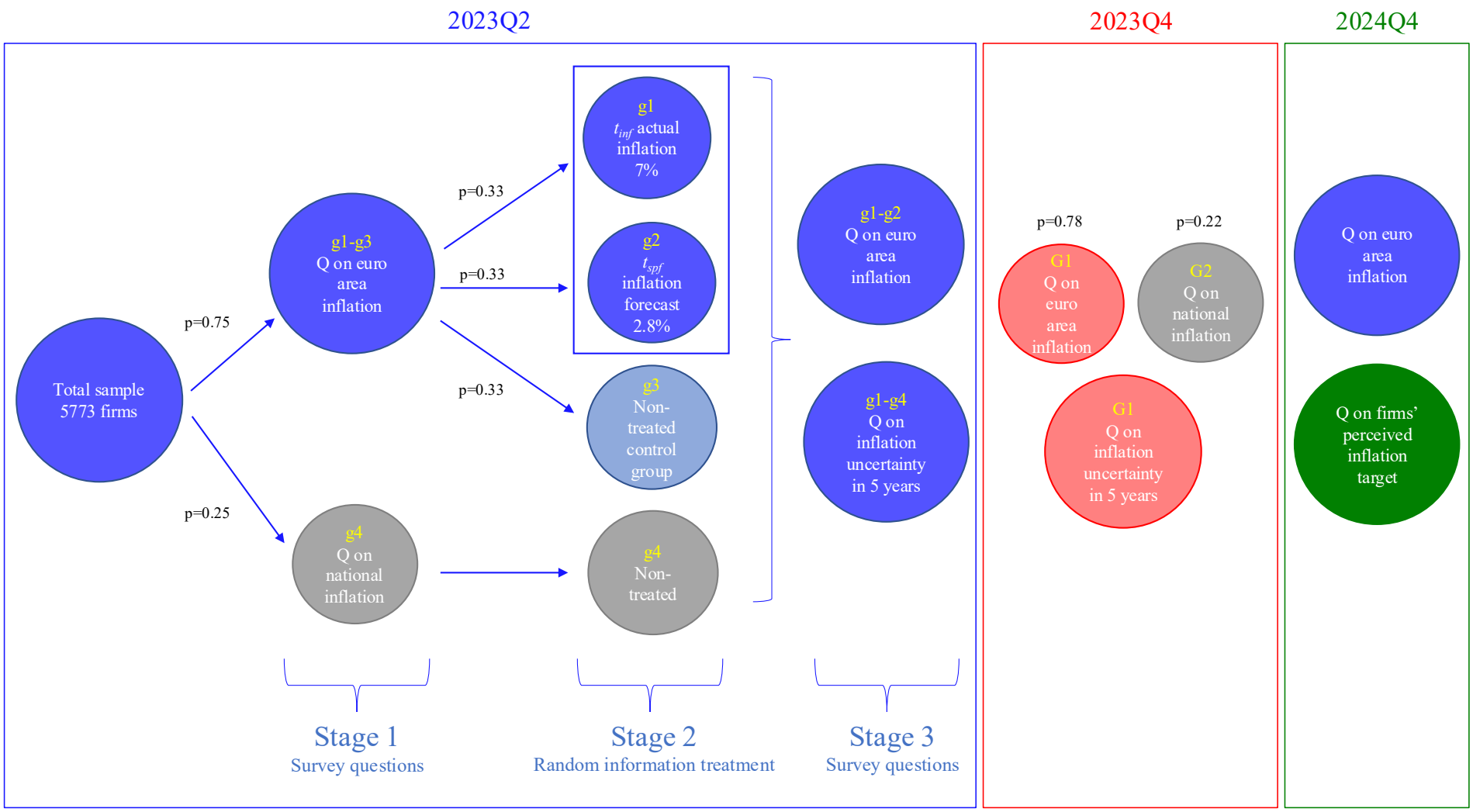
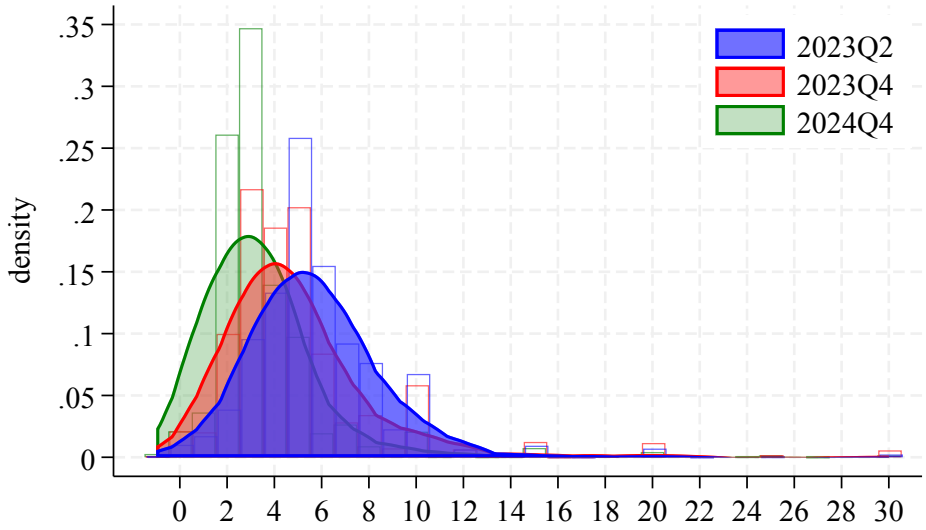
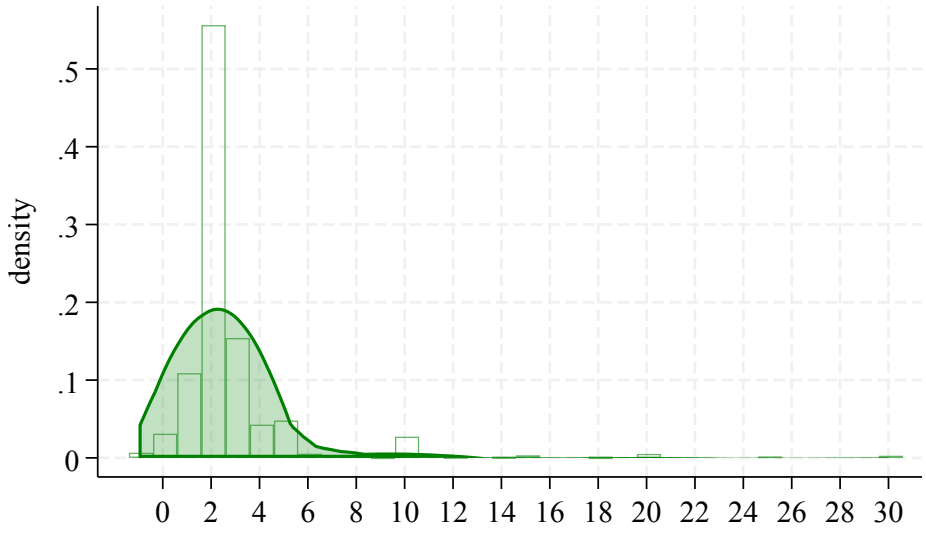


Figure 2: Histogram of euro area inflation expectations and perceived inflation targets (in %)

Panel A: Euro area inflation expectations

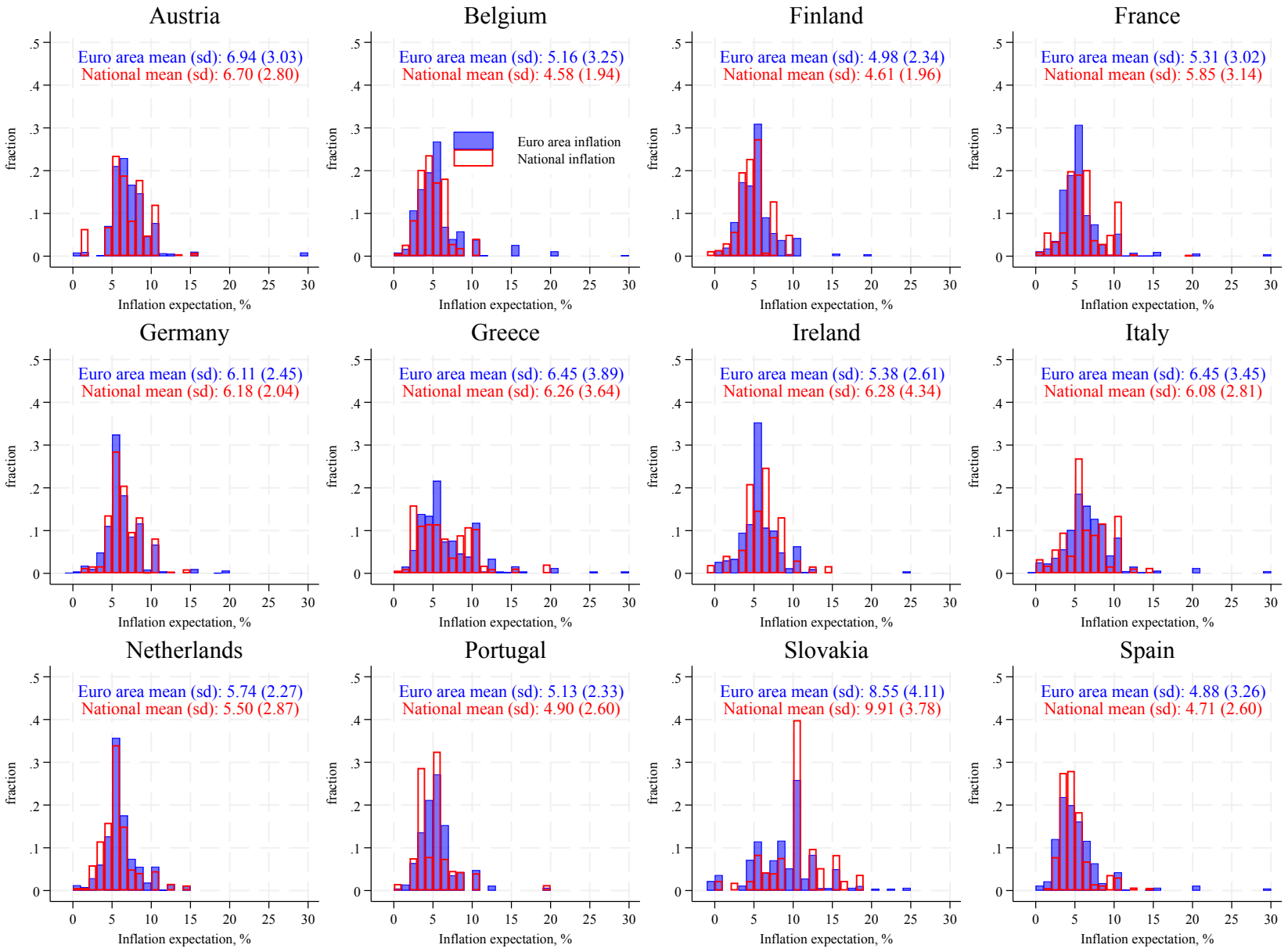


Panel B: Perceived inflation target



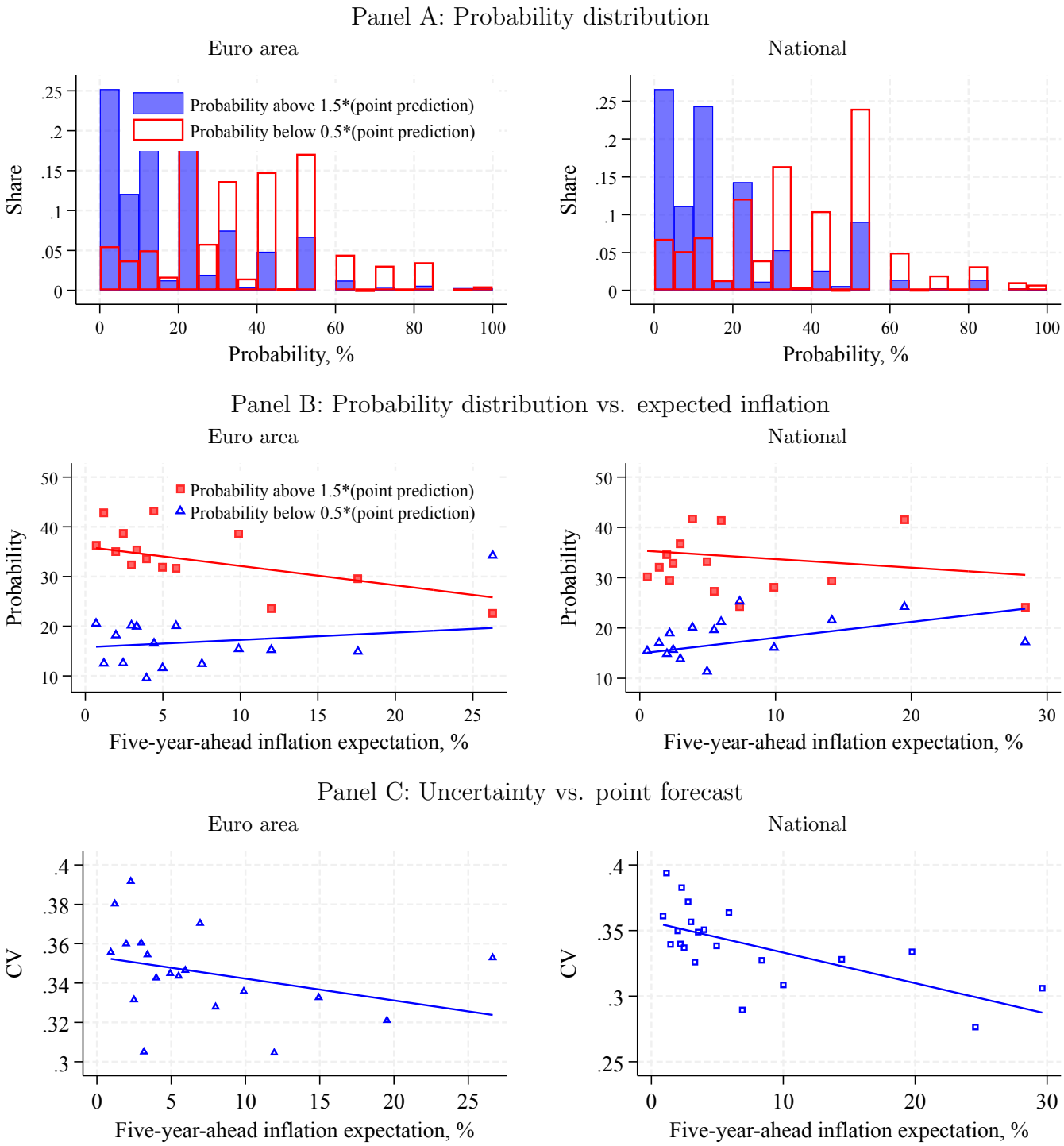
Notes: The figures plot distributions based on pre-treatment responses for 2023Q2 and control group responses for 2023Q4 and 2024Q4. Inflation expectations and perceived inflation targets are trimmed at -1% and 30%.

Figure 3: Histogram of euro area and national inflation expectations by country



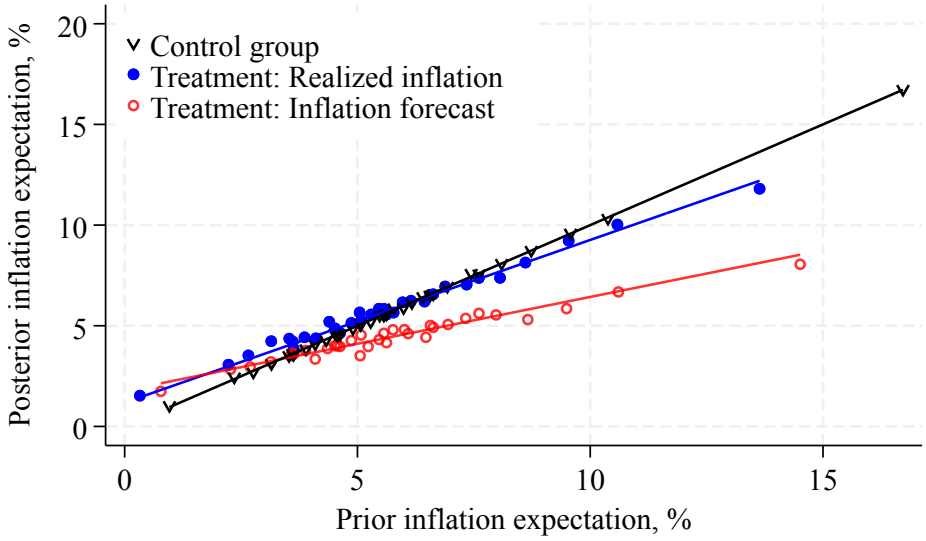
Notes: The histograms plot distributions based on pre-treatment responses for 2023Q2. Inflation expectations are trimmed at -1% and 30%.

Figure 4: Uncertainty in 5-year-ahead inflation expectations



Notes: Figures in Panel A show the distribution of probabilities assigned to lower and upper tails of reported subjective probability distributions for inflation expectations. Figures in Panels B and C are binscatter plots showing the joint distribution of inflation expectations and probabilities assigned to the tails. All moments are for inflation expectations at the 5-year-ahead horizon. The figure is based on the control group only.

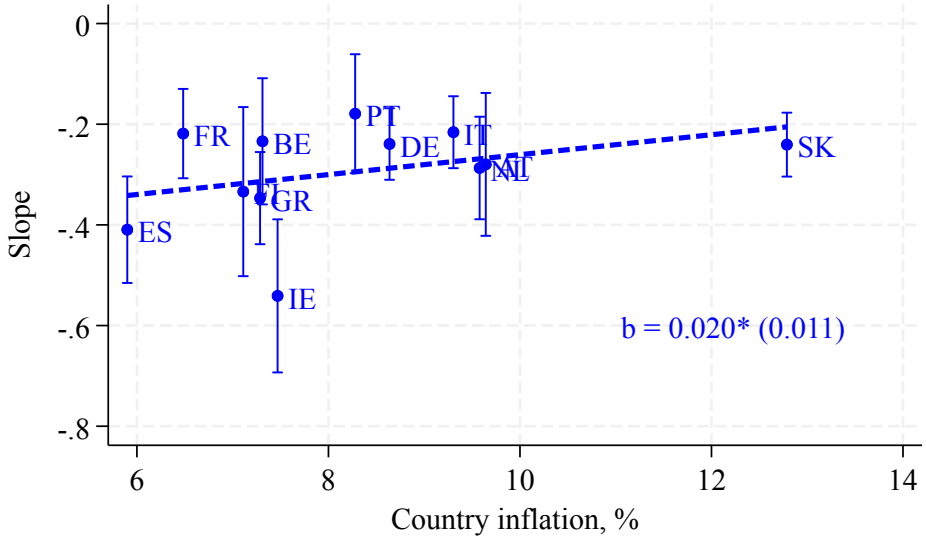
Figure 5: Prior vs. posterior inflation expectations by RCT treatment group



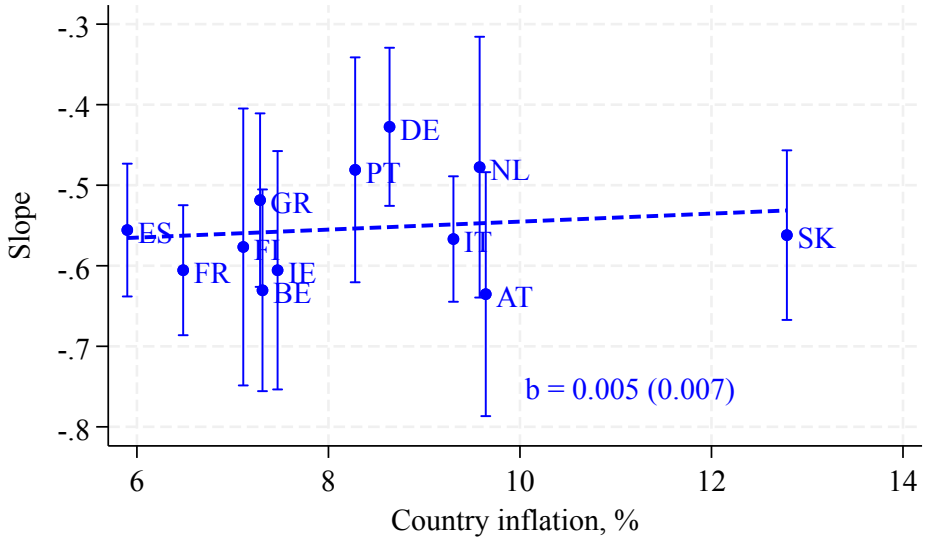
Notes: The figure is a binscatter plot of prior expectations against posterior expectations. Huber weights are applied to minimize the influence of outliers.

Figure 6: Country-specific belief adjustment and actual inflation

Panel A: Treatment with past inflation

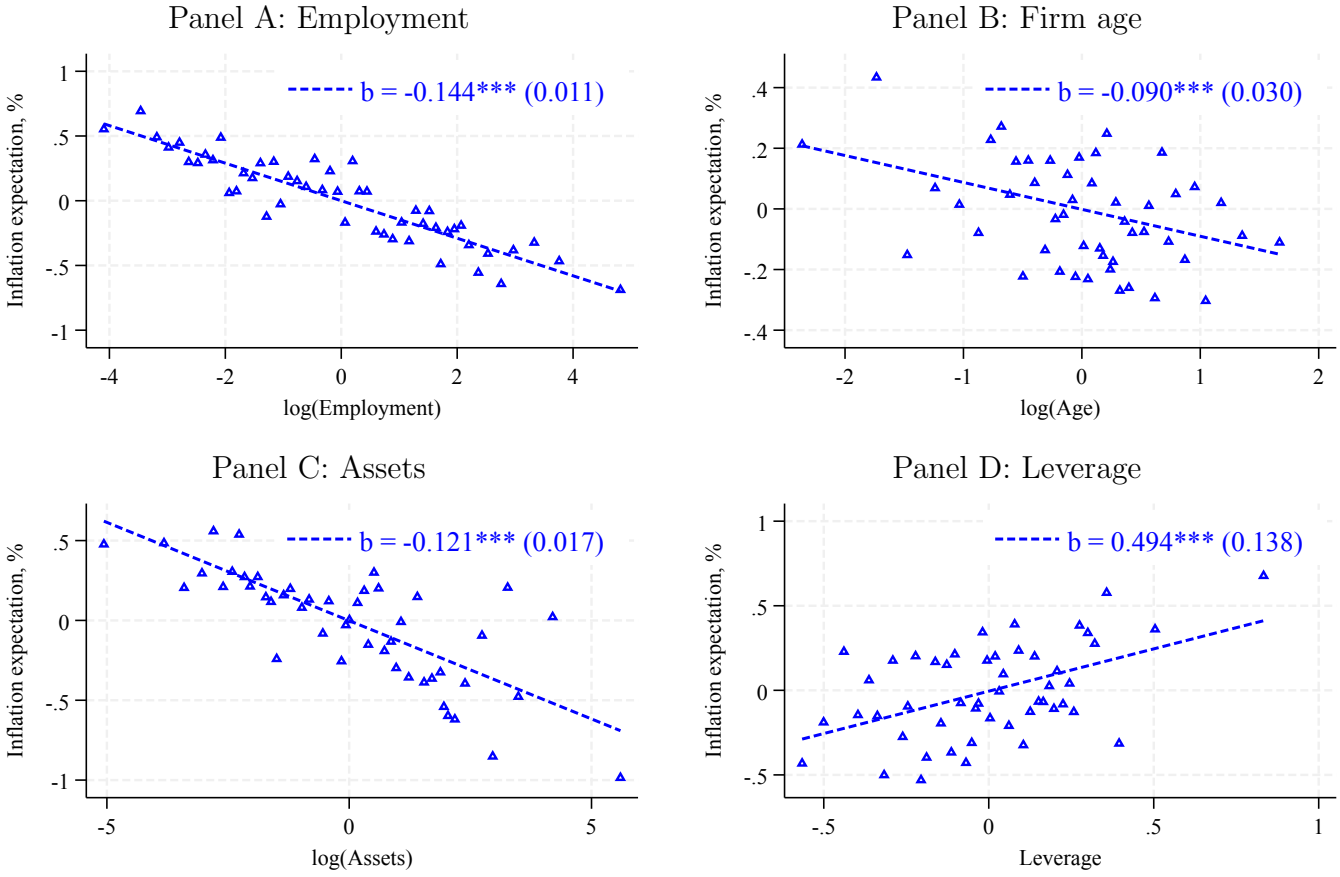


Panel B: Treatment with inflation forecast



Notes: The figures show country-specific treatment effects (b) of information provision about past inflation (Panel A) and an inflation forecast (Panel B), i.e., b_j (where $j \in$ {Past inflation, Inflation forecast}) from specification (1) estimated country-by-country. The whiskers denote 90% confidence bands. Country inflation on the x-axis is measured by four-quarter backward-looking moving averages.

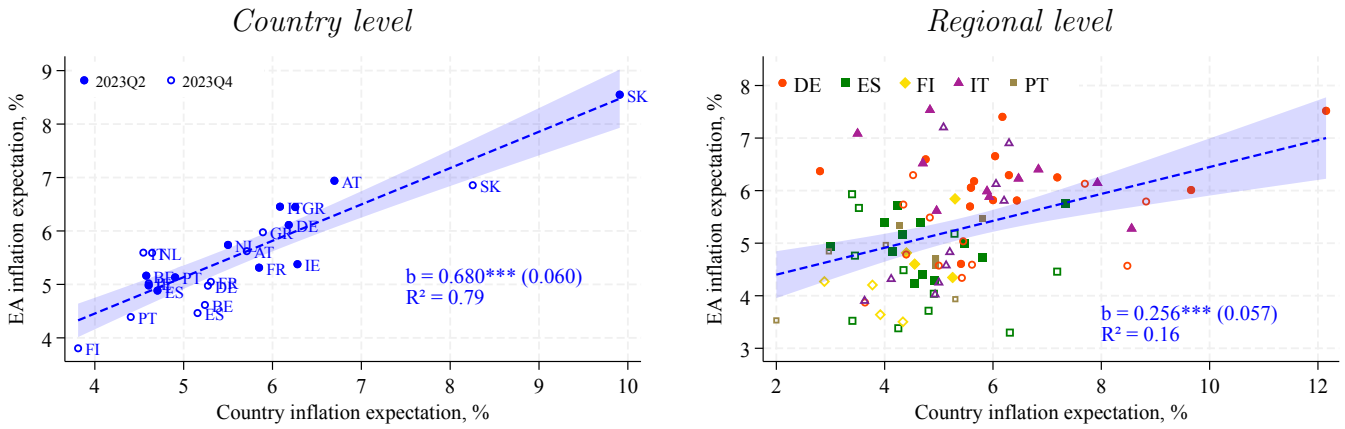
Figure 7: Binscatter plot of firm characteristics and inflation expectations



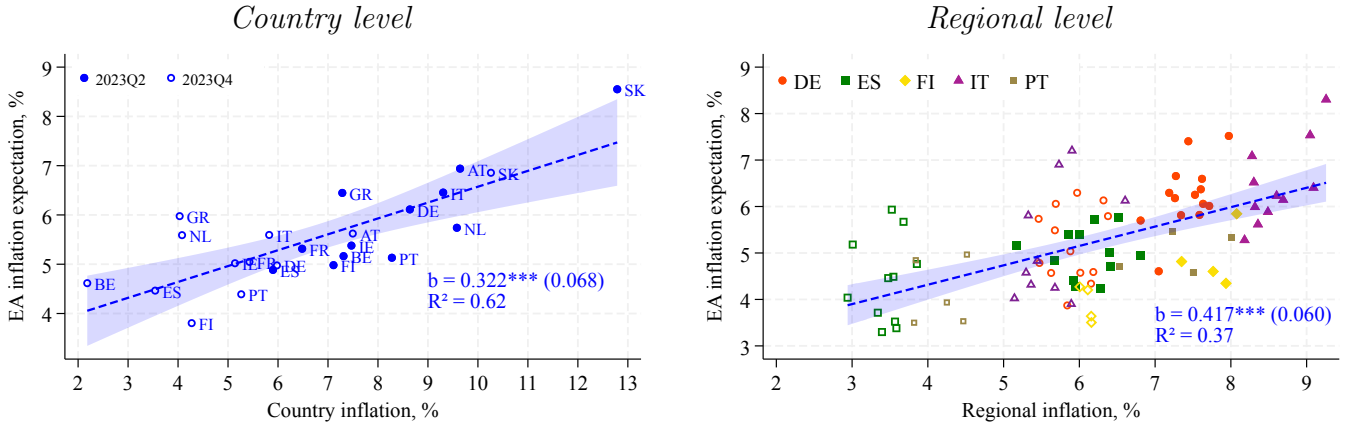
Notes: The figure shows binned scatter plots of various firm characteristics against firms' inflation expectations, with Huber weights and conditional on country, sector and time fixed effects.

Figure 8: Euro area inflation expectations, national inflation expectations, and actual inflation

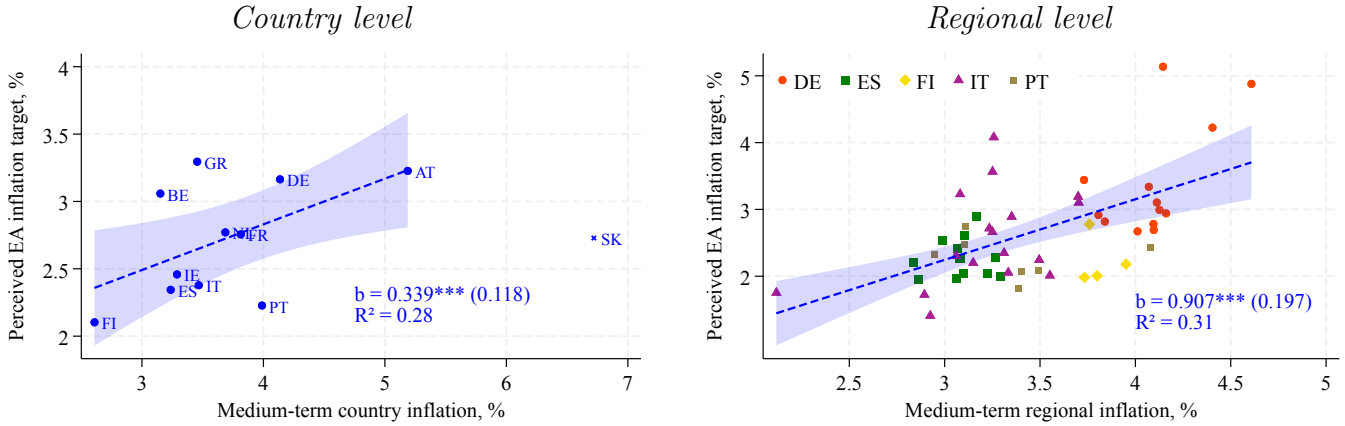
Panel A: Euro area and national inflation expectations



Panel B: Euro area expectations and actual inflation



Panel C: Euro area inflation target and actual medium-term inflation



Notes: Panel A plots average expectations about euro area inflation (y-axis) against average expectations about national inflation (x-axis). Panel B plots average expectations about euro area inflation against actual inflation. At the country level, we use averages at the country-time level and at the regional level, we use averages at the region-time level. Filled dots refer to 2023Q2 and hollow dots refer to 2023Q4. Country and regional inflation are measured by four-quarter backward-looking moving averages. In Panel B (right) we drop the outlier data point (14.1,5.0) of the Italian Campania region in 2023Q4, which does not affect the estimated regression slope. Panel C plots average perceived euro area inflation targets against actual inflation. In Panel C (right) we exclude Slovakia from the linear fit. Including Slovakia yields an estimated slope of 0.119 (0.106). Country and regional medium-term inflation are measured by eight-quarter backward-looking moving averages.

Appendix:
Firms' Inflation Expectations in a Monetary Union

Ursel Baumann Annalisa Ferrando Dimitris Georgarakos

Yuriy Gorodnichenko Timo Reinelt

A Additional empirical results

Table A.1: Survey descriptive statistics

	Mean	Std.	p10	Median	p90
Employment	862.0	9974.7	3	50	760
Export share, %	16.9	28.6	0	0	70
Firm age (in years)	34.8	28.1	10	28	67
	Share (%)				
Country					
AT	5.6				
BE	6.9				
DE	12.4				
ES	13.1				
FI	4.4				
FR	13.1				
GR	7.0				
IE	4.4				
IT	13.1				
NL	8.5				
PT	7.1				
SK	4.4				
Sector					
Manufacturing	24.0				
Construction	11.8				
Trade	23.0				
Services	41.2				

Table A.2: Survey variables

Variable	Question	Definition
Turnover	"Has turnover increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Labor costs	"Have labor costs (including social contributions) increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Other costs	"Have other costs (materials, energy, other) increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Interest expenses	"Have interest expenses increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Profit	"Has profit increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Fixed investment	"Have investments in property, plant or equipment increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Inventories/working capital	"Have inventories and other working capital increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Leverage	"Has debt compared to assets increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Employees	"Has the number of employees increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Bank loan/trade credit/credit line needs	"Would you say that your needs for bank loans have improved, remained unchanged or deteriorated for your enterprise over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Bank loan/trade credit/credit lines availability	"Would you say that the availability of bank loans has improved, remained unchanged or deteriorated for your enterprise over the past six months?"	Increased [1]; Unchanged/Decreased [0]
Financing gap in bank loans/trade credit/credit lines	The difference between changes in needs and availability of bank loans/trade credit/credit lines	Equal to 1 (-1) if the need increases (decreases) and availability decreases (increases). In case of a one-sided increase (decrease), it takes value 0.5 (-0.5)
Financing constraints	The firm's application for a bank loan or credit line in the past 6 months was not approved; the firm received less than 75 percent of the loan amount it requested; the firm itself rejected the loan offer because the borrowing costs were too high or the firm did not apply for a loan for fear of rejection	Yes [1]; No [0]
Financial vulnerability	Simultaneous decline in turnover, decline in profits, increase in interest expenses and increase or unchanged debt-to-assets ratio	Yes [1]; No [0]

Table A.2 (continued): Survey variables

Expected turnover	"Looking ahead, please indicate whether you think your company's turnover will increase, remain unchanged or decrease over the next six months?"	Increase [1]; Unchanged/ Decrease [0]
Expected investment	"Looking ahead, please indicate whether you think your company's investments in property, plant or equipment will increase, decrease or remain unchanged over the next six months"	Increase [1]; Unchanged/ Decrease [0]
Macro outlook	"Would you say that the general economic outlook has improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged/ deteriorated [0]
Public financial support	"Would you say that access to public financial support, including guarantees, has improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged/ deteriorated [0]
Firm-specific outlook	"Would you say that Your enterprise-specific outlook with respect to your sales and profitability or business plan has improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged/ deteriorated [0]
Firm capital	"Would you say that your enterprise's own capital has improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged/ deteriorated [0]
Firm credit history	"Would you say that your enterprise's credit history has improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged/ deteriorated [0]
Willingness firm trade credit	"Would you say that the willingness of business partners to provide trade credit has improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged/ deteriorated [0]
Willingness banks credit	"Would you say that the willingness of banks to provide credit has improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged/ deteriorated [0]
Willingness partners	"Would you say that the willingness of investors to invest in your enterprise has improved, remained unchanged or deteriorated over the past six months?"	Improved [1]; Unchanged/ deteriorated [0]

Table A.3: Number of regions and dispersion in regional inflation rates by country

	DE	ES	FI	IT	PT	Aggregate
Number of NUTS regions	16	19	6	21	7	69
σ_R (in p.p.)	0.58	0.41	0.81	0.49	0.66	0.59

Table A.4: Available surveys of firms' inflation expectations in euro area countries.

Country/Survey	Target sample size	Sectors/size threshold	Time series	Survey mode	Outlier treatment	Phrasing of questions on inflation expectations
Italy: Survey on Inflation and Growth Expectations (SIGE), Banca d'Italia	1,500	Non-financial private sector with at least 50 employees	Since 1999Q4	About 90% collected online, 10% by telephone interview	Data trimmed at 5th/95th percentiles	1. In [two months earlier] consumer price inflation, measured by the 12-month change in the harmonised index of consumer prices was equal to [IT] in Italy and to [EA] in the euro area. What do you think it will be in Italy • in 6 months • in 12 months • in 24 months • on average between 3 and 5 years?
Germany: Bundesbank Online Panel – Firms	9,000	Firms outside agriculture and the public sector, with at least 1 employee and turnover above EUR 17,500/year	Since 2020Q2	Online	Responses between $-12/+12\%$ Alternative treatments: – Responses between $-24/+24\%$ – Data winsorised at 2nd/98th percentiles	1. What do you expect the rate of inflation to be over the next twelve months? 2. In your opinion, how likely is it that the rate of inflation will change as follows over the next twelve months? [10 bins provided: deflation ≥ 12, 8–12, 4–8, 2–4, 0–2, inflation 0–2, 2–4, 4–8, 8–12, ≥ 12]. 3. What do you expect the rate of inflation to be on average over the next three years? 4. What do you expect the rate of inflation to be on average over the next five years?
France: Quarterly survey of inflation expectations, Banque de France	1,700	Non-financial companies with at least 1 employee	Since 2021Q4	Telephone interview	Data trimmed at 1st/99th percentile	1. As a percentage, what do you think is the current inflation rate in France? 2. As a percentage, what do you think the inflation rate will be in France in one year? 3. As a percentage, what do you think the inflation rate will be in France in 3 to 5 years?

Table A.5: Randomization of group assignment

	Group assignment			
	Euro area inflation			National inflation
	Control	Treatment with past inflation	Treatment with inflation forecast	
	(1)	(2)	(3)	(4)
Firm size				
more than 2 million and up to 10 million euros	ref.	ref.	ref.	ref.
more than 10 million and up to 50 million euros	0.0230	0.0263	-0.0270	-0.0223
	(0.0344)	(0.0389)	(0.0343)	(0.0351)
more than 50 million euros	-0.0110	-0.0432	0.0224	0.0319
	(0.0476)	(0.0541)	(0.0474)	(0.0497)
up to 500 thousand euros	0.0483	0.0342	-0.0474	-0.0351
	(0.0361)	(0.0336)	(0.0291)	(0.0298)
more than 500 thousand and up to 1 million euros	-0.0242	0.0378	-0.00233	-0.0113
	(0.0347)	(0.0397)	(0.0299)	(0.0310)
more than 1 million and up to 2 million euros	0.0200	-0.00336	-0.0204	0.00372
	(0.0277)	(0.0281)	(0.0273)	(0.0322)
[DK/NA]	-0.0341	0.0128	0.0365	-0.0153
	(0.0554)	(0.0741)	(0.0911)	(0.0569)
Employment				
From 1 employee to 9 employees	ref.	ref.	ref.	ref.
From 10 employees to 49 employees	0.0263	0.00836	-0.0238	-0.0109
	(0.0251)	(0.0242)	(0.0220)	(0.0231)
From 50 employees to 249 employees	-0.00959	0.0209	0.00555	-0.0169
	(0.0391)	(0.0396)	(0.0315)	(0.0335)
250 employees or more	0.0130	0.0967	-0.0693	-0.0404
	(0.0550)	(0.0599)	(0.0452)	(0.0491)
Sector				
Industry	ref.	ref.	ref.	ref.
Construction	0.0275	0.0133	-0.0371	-0.00376
	(0.0308)	(0.0376)	(0.0330)	(0.0334)
Trade	0.0409	-0.000379	-0.0198	-0.0208
	(0.0300)	(0.0327)	(0.0296)	(0.0302)
Services	0.0342	-0.0318	-0.0135	0.0111
	(0.0275)	(0.0285)	(0.0272)	(0.0284)
Firm age				
10 years or more	ref.	ref.	ref.	ref.
5 years or more but less than 10 years	0.00566	0.0221	-0.0239	-0.00390
	(0.0384)	(0.0427)	(0.0265)	(0.0385)
2 years or more but less than 5 years	-0.0565	0.0603	0.0637	-0.0675*
	(0.0421)	(0.0521)	(0.0717)	(0.0396)

Table A.5 (continued): Randomization of group assignment

Less than 2 years	0.0452	0.217**	-0.139***	-0.123*
	(0.0993)	(0.106)	(0.0437)	(0.0687)
Country				
AT	ref.	ref.	ref.	ref.
BE	-0.0531	0.0392	0.0201	-0.00624
	(0.0433)	(0.0472)	(0.0451)	(0.0451)
DE	-0.0126	0.0384	-0.00563	-0.0202
	(0.0412)	(0.0398)	(0.0378)	(0.0389)
ES	0.000725	0.0209	-0.00887	-0.0127
	(0.0423)	(0.0393)	(0.0376)	(0.0395)
FI	-0.0332	0.0116	0.0244	-0.00276
	(0.0498)	(0.0488)	(0.0503)	(0.0500)
FR	-0.0319	0.00316	0.0254	0.00333
	(0.0424)	(0.0408)	(0.0415)	(0.0418)
GR	-0.0272	0.0301	0.000907	-0.00382
	(0.0446)	(0.0444)	(0.0411)	(0.0436)
IE	0.0153	0.0146	-0.0168	-0.0130
	(0.0545)	(0.0512)	(0.0463)	(0.0480)
IT	-0.0345	0.0207	0.000492	0.0133
	(0.0396)	(0.0391)	(0.0377)	(0.0400)
NL	-0.00254	0.0112	0.00189	-0.0105
	(0.0460)	(0.0424)	(0.0418)	(0.0426)
PT	-0.0306	0.0248	0.0327	-0.0270
	(0.0465)	(0.0441)	(0.0444)	(0.0418)
SK	-0.0124	0.0348	0.00217	-0.0245
	(0.0487)	(0.0472)	(0.0456)	(0.0450)
Observations	5733	5733	5733	5733
F-statistic	0.87	0.70	1.24	0.53
p-value(F-statistic)	0.65	0.87	0.19	0.98

Notes: The dependent variable is equal to one if a firm is assigned to a given group (indicated in the column title) and zero otherwise. All coefficients are estimated with OLS. Robust standard errors are in parentheses. ***,**,* indicate statistical significance at 1, 5, and 10 percent levels. p-value(F-statistic) is the p-value for the F-statistic testing whether all coefficients are jointly zero.

Table A.6: Logit regressions for missing responses

	Missing response		
	Euro area inflation expctation	National inflation expctation	Perceived euro area inflation target
	(1)	(2)	(3)
Firm size			
more than 2 million and up to 10 million euros	ref.	ref.	ref.
more than 10 million and up to 50 million euros	-0.0518*	-0.0134	-0.00648
	(0.0296)	(0.0434)	(0.0414)
more than 50 million euros	-0.121***	-0.152***	-0.0711
	(0.0345)	(0.0530)	(0.0504)
up to 500 thousand euros	0.0281	0.0716	0.0353
	(0.0249)	(0.0471)	(0.0276)
more than 500 thousand and up to 1 million euros	0.0588**	0.0183	0.00168
	(0.0275)	(0.0424)	(0.0277)
more than 1 million and up to 2 million euros	0.00875	-0.0378	0.00769
	(0.0218)	(0.0393)	(0.0262)
[DK/NA]	0.212***	0.174**	0.189***
	(0.0662)	(0.0778)	(0.0729)
Employment			
From 1 employee to 9 employees	ref.	ref.	ref.
From 10 employees to 49 employees	-0.0109	0.0189	0.00397
	(0.0162)	(0.0292)	(0.0204)
From 50 employees to 249 employees	-0.0185	-0.00364	-0.0235
	(0.0261)	(0.0432)	(0.0298)
250 employees or more	-0.00781	0.00649	-0.0494
	(0.0398)	(0.0679)	(0.0439)
Sector			
Industry	ref.	ref.	ref.
Construction	-0.00761	-0.0453	0.0729**
	(0.0242)	(0.0442)	(0.0294)
Trade	-0.0317	-0.0397	0.0390*
	(0.0226)	(0.0347)	(0.0221)
Services	-0.0596***	-0.0664*	0.0701***
	(0.0199)	(0.0367)	(0.0234)
Firm age			
10 years or more	ref.	ref.	ref.
5 years or more but less than 10 years	-0.0173	0.00519	-0.0362
	(0.0248)	(0.0382)	(0.0248)
2 years or more but less than 5 years	-0.0124	0.00737	-0.0347
	(0.0310)	(0.0550)	(0.0365)
Less than 2 years	0.181**	-0.0305	-0.0811

Table A.6 (continued): Logit regressions for missing responses

	(0.0783)	(0.0928)	(0.0681)
Country			
AT	ref.	ref.	ref.
BE	0.0511	0.130***	0.0105
	(0.0342)	(0.0377)	(0.0331)
DE	-0.0153	0.103***	-0.00429
	(0.0284)	(0.0284)	(0.0291)
ES	0.140***	0.190***	0.130***
	(0.0310)	(0.0340)	(0.0356)
FI	0.0551	0.102***	0.0437
	(0.0372)	(0.0362)	(0.0518)
FR	0.124***	0.216***	0.152***
	(0.0327)	(0.0380)	(0.0380)
GR	0.163***	0.228***	0.173***
	(0.0353)	(0.0441)	(0.0366)
IE	-0.00913	0.143**	-0.0386
	(0.0329)	(0.0572)	(0.0296)
IT	0.220***	0.292***	0.173***
	(0.0313)	(0.0325)	(0.0324)
NL	0.0645*	0.105***	0.0270
	(0.0335)	(0.0298)	(0.0310)
PT	0.144***	0.159***	-0.00485
	(0.0338)	(0.0324)	(0.0287)
SK	0.120***	0.266***	0.112***
	(0.0370)	(0.0463)	(0.0412)
Observations	8404	2850	5176
Pseudo-R2	0.07	0.07	0.07
Missing frequency	0.23	0.23	0.21

Notes: This table shows the marginal effects from a logit regression of missing responses on firm size, employment, sector, age, and country fixed effects. Heteroskedasticity-robust standard errors are shown in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table A.7: Descriptive statistics adjusting for frequency of non-response (in %)

		Euro area inflation expectation		National inflation expectation		Perceived euro area inflation target	
		Baseline	IPW	Baseline	IPW	Baseline	IPW
		(1)	(2)	(3)	(4)	(5)	(6)
Austria	2023q2	6.94	6.96	6.70	6.72		
	2023q4	5.62	5.67	5.71	5.71		
	2024q4	3.31	3.33			3.23	3.22
Belgium	2023q2	5.16	5.27	4.58	4.59		
	2023q4	4.62	4.76	5.24	5.32		
	2024q4	3.96	4.03			3.06	3.12
Germany	2023q2	6.11	6.12	6.18	6.21		
	2023q4	4.98	5.04	5.27	5.34		
	2024q4	3.63	3.65			3.16	3.18
Spain	2023q2	4.88	4.94	4.71	4.72		
	2023q4	4.46	4.55	5.16	5.24		
	2024q4	3.06	3.09			2.34	2.36
Finland	2023q2	4.98	5.01	4.61	4.58		
	2023q4	3.80	3.83	3.81	3.83		
	2024q4	2.76	2.78			2.10	2.12
France	2023q2	5.31	5.40	5.85	5.94		
	2023q4	5.05	5.14	5.31	5.39		
	2024q4	3.32	3.41			2.76	2.82
Greece	2023q2	6.45	6.53	6.26	6.26		
	2023q4	5.98	5.96	5.89	6.05		
	2024q4	4.05	4.07			3.29	3.31
Ireland	2023q2	5.38	5.40	6.28	6.34		
	2023q4	5.02	5.05	4.61	4.59		
	2024q4	3.02	3.04			2.46	2.45
Italy	2023q2	6.45	6.47	6.08	6.20		
	2023q4	5.59	5.67	4.55	4.66		
	2024q4	3.13	3.20			2.38	2.43
Netherlands	2023q2	5.74	5.75	5.50	5.56		
	2023q4	5.59	5.66	4.64	4.67		
	2024q4	4.38	4.42			2.77	2.78
Portugal	2023q2	5.13	5.16	4.90	4.94		
	2023q4	4.39	4.43	4.40	4.42		
	2024q4	3.04	3.06			2.23	2.23
Slovakia	2023q2	8.55	8.68	9.91	9.87		
	2023q4	6.86	6.84	8.25	8.24		
	2024q4	4.98	5.08			2.73	2.77

Notes: This table shows descriptive statistics as in Table 1. Statistics in columns (1), (3), and (5) reproduce those in Table 1. Statistics in columns (2), (4), and (6) are adjusted with inverse probability weighting (IPW) which weights firms' inflation expectations and perceived inflation target responses by the inverse predicted probability of a non-missing response based on a logit regression on firm size, employment, sector, age, and country fixed effects, as documented in Table A.6.

Table A.8: Shapley decomposition of R^2 for longer-term expectations

	Euro area inflation expectation							
	3-years-ahead				5-years-ahead			
	Country FEs		Region FEs		Country FEs		Region FEs	
	contrib.	share	contrib.	share	contrib.	share	contrib.	share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Demographics of firms	0.0751	0.29	0.0674	0.20	0.0735	0.26	0.0722	0.21
Firms' choices and constraints	0.0586	0.22	0.0601	0.18	0.0720	0.26	0.0795	0.23
Sector fixed effects	0.0796	0.30	0.0815	0.25	0.0983	0.35	0.0915	0.27
Country fixed effects	0.0486	0.19	—	—	0.0350	0.13	—	—
Region fixed effects	—	—	0.1217	0.37	—	—	0.0955	0.28
Total	0.2619	1	0.3308	1	0.2787	1	0.3388	1

Notes: The table reports Shapley (1953) decomposition of R^2 for blocks of variables. Demographics of firms includes age, turnover, subsidiary status, location of parent company, main firm owner, export share and employment. Firm's choices and constraints includes variables capturing firm-level and aggregate outlook, as well as financial conditions. Shapley decompositions of inflation expectations are reported for 2023Q2. Columns (1)-(2) and (5)-(6) include country fixed effects, while columns (3)-(4) and (7)-(8) include region fixed effects (at the level of NUTS-2 regions for all countries except Germany where they are based on NUTS-1 regions). Columns (1), (3), (5), and (7) report the marginal R^2 for a given block of variables. Columns (2), (4), (6), and (8) report the share in total R^2 reported in the bottom row. All columns use only firms for which NUTS regions are known.

Table A.9: Euro area inflation expectations and realized inflation at different horizons

	Euro area inflation expectation							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$h = 1$	$h = 2$	$h = 4$	$h = 6$	$h = 8$	$h = 10$	$h = 12$	$h = 16$
Panel A: Country level								
Country inflation	0.303***	0.311***	0.360***	0.514***	0.595***	0.565***	0.548**	0.682***
	(0.0591)	(0.0543)	(0.0633)	(0.0832)	(0.156)	(0.188)	(0.206)	(0.236)
Constant	4.160***	3.840***	3.026***	1.749***	1.453	2.149*	2.743**	2.820***
	(0.314)	(0.337)	(0.454)	(0.598)	(1.031)	(1.084)	(1.006)	(0.906)
Observations	24	24	24	24	24	24	24	24
R^2	0.607	0.640	0.683	0.703	0.542	0.379	0.310	0.382
Panel B: Regional level								
Regional inflation	0.334***	0.378***	0.466***	0.713**	0.758***	0.207	-0.102	0.375
	(0.0479)	(0.0400)	(0.0761)	(0.176)	(0.141)	(0.235)	(0.251)	(0.228)
Constant	3.811***	3.316***	2.304***	0.501	0.506	4.099**	5.711**	3.892**
	(0.232)	(0.102)	(0.391)	(1.100)	(0.881)	(1.371)	(1.290)	(0.900)
Observations	88	88	88	88	88	88	88	88
R^2	0.366	0.416	0.435	0.313	0.117	0.009	0.002	0.018
Panel C: Regional level, within countries								
Regional inflation	0.466*	0.612*	0.695*	0.707**	0.777**	0.891**	0.998**	1.218**
	(0.169)	(0.277)	(0.286)	(0.245)	(0.239)	(0.284)	(0.322)	(0.333)
Constant	3.311***	2.142	0.875	0.527	0.379	0.336	0.584	0.873
	(0.698)	(1.400)	(1.789)	(1.631)	(1.489)	(1.557)	(1.499)	(1.193)
Observations	88	88	88	88	88	88	88	88
R^2	0.555	0.568	0.591	0.594	0.596	0.596	0.592	0.589
Country × time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Country and regional inflation are measured by backward-looking moving averages $\frac{1}{H}\sum_{p=1}^{H}\pi_{t-p+1}$ and H is given in the second row of the table. Huber-robust regressions. Panel A uses heteroskedasticity-robust standard errors, Panels B and C use standard errors clustered by countries; shown in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table A.10: IV regression of euro area expectations on national inflation expectations

	Euro area inflation expectation							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$h = 1$	$h = 2$	$h = 4$	$h = 6$	$h = 8$	$h = 10$	$h = 12$	$h = 16$
Panel A: Regional level								
National inflation expectation	0.596	0.355	0.311**	0.482*	0.339	0.247	0.304	0.404
	(0.909)	(0.296)	(0.141)	(0.266)	(0.245)	(0.254)	(0.378)	(0.520)
Constant	2.396	3.897**	4.155***	3.058*	3.949***	4.536***	4.182*	3.558
	(5.646)	(1.863)	(0.875)	(1.627)	(1.521)	(1.579)	(2.339)	(3.206)
Observations	86	86	86	86	86	86	86	85
R^2	0.031	0.463	0.511	0.247	0.430	0.520	0.467	0.327
Panel B: Regional level, pooling across survey rounds								
National inflation expectation	0.816*	0.826**	0.960**	1.110*	0.739	0.734	1.022	2.018
	(0.453)	(0.390)	(0.467)	(0.605)	(0.532)	(0.726)	(1.925)	(5.715)
Observations	56	56	56	56	56	56	56	56
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR Wald test p-value	0.007	0.001	0.000	0.000	0.105	0.216	0.345	0.160

Notes: Panel A reports versions of specification (15) where regional inflation is measured by backward-looking moving averages with bandwidths given by h in columns (1)-(8). Panel B estimates specifications which use average expectations and actual inflation across survey rounds. Heteroskedasticity-robust standard errors in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table A.11: Relationship between euro area inflation expectations and realized regional inflation, controlling for further firm characteristics

	Euro area inflation expectation			
	(1)	(2)	(3)	(4)
Regional inflation	0.506***	0.535***	0.533***	0.520***
	(0.0396)	(0.0536)	(0.0541)	(0.0555)
Country				
DE		ref.	ref.	ref.
ES		0.0816	0.0546	0.0292
		(0.130)	(0.130)	(0.135)
FI		-0.936***	-0.942***	-0.938***
		(0.0735)	(0.0716)	(0.0941)
IT		-0.123	-0.215*	-0.181
		(0.106)	(0.108)	(0.116)
PT		-0.324**	-0.383***	-0.402**
		(0.128)	(0.138)	(0.153)
Sector				
Industry		ref.	ref.	ref.
Construction		0.258**	0.183	0.169
		(0.119)	(0.132)	(0.124)
Trade		-0.00250	-0.0713	-0.131*
		(0.0778)	(0.0776)	(0.0721)
Services		0.109	-0.000770	-0.0597
		(0.0825)	(0.0819)	(0.0788)
Firm size				
more than 2 million and up to 10 million euros			ref.	ref.
more than 10 million and up to 50 million euros			0.0309	0.0786
			(0.0931)	(0.0912)
more than 50 million euros			-0.0973	-0.0845
			(0.103)	(0.106)
up to 500 thousand euros			0.0444	0.0719
			(0.134)	(0.138)
more than 500 thousand and up to 1 million euros			0.0527	0.0950
			(0.0905)	(0.104)
more than 1 million and up to 2 million euros			-0.0315	-0.0122
			(0.109)	(0.0998)
[DK/NA]			0.175	0.146
			(0.261)	(0.221)
Employment				
From 1 employee to 9 employees			ref.	ref.
From 10 employees to 49 employees			-0.0101	0.00855
			(0.100)	(0.107)

Table A.11 (continued): Relationship between euro area inflation expectations and realized regional inflation

From 50 employees to 249 employees	-0.179	-0.153
	(0.112)	(0.139)
250 employees or more	-0.255**	-0.174
	(0.126)	(0.142)
Firm age		
10 years or more	ref.	ref.
5 years or more but less than 10 years	-0.152	-0.0854
	(0.108)	(0.114)
2 years or more but less than 5 years	0.271**	0.222*
	(0.127)	(0.131)
Less than 2 years	0.158	0.262
	(0.514)	(0.523)
Increase in Turnover		0.0289
		(0.0449)
Increase in Labour cost		0.0441
		(0.0589)
Increase in Other cost		0.168***
		(0.0549)
Increase in Interest expenses		-0.0512
		(0.0546)
Increase in Profits		-0.0863
		(0.0590)
Increase in Fixed investment		-0.0421
		(0.0499)
Increase in Inventories/Working capital		0.0504
		(0.0469)
Increase in Employees		0.0366
		(0.0667)
Increase in Leverage		0.0197
		(0.0439)
Increase in Expected turnover		-0.0148
		(0.0509)
Increase in Expected investments		-0.0337
		(0.0483)
Increase in Macro outlook		-0.0268
		(0.0927)
Increase in Public financial support		-0.134
		(0.0978)
Increase in Firm-specific outlook		0.0693
		(0.0517)
Increase in Firm capital		-0.158**
		(0.0725)
Increase in Firm credit history		-0.0254
		(0.0474)
Increase in Willingness of firm to exend trade credit		-0.0261

Table A.11 (continued): Relationship between euro area inflation expectations and realized regional inflation

				(0.0774)
Increase in Willingness of banks to extend credit				0.0401
				(0.0753)
Increase in Willingness of partners to extend trade credit				-0.244
				(0.146)
Constant	1.627***	1.422***	1.668***	1.695***
	(0.237)	(0.358)	(0.344)	(0.355)
Observations	2323	2323	2323	2323
R^2	0.190	0.205	0.214	0.240

Notes: Regional inflation is measured by four-quarter backward-looking moving averages. Huber weights from regression (1) are applied. Heteroskedasticity-robust standard errors are shown in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table A.12: Firm-level heterogeneity in the relationship between euro area inflation expectations and realized inflation vs. regional GDP growth and unemployment rate

	(1)	(2)	(3)	(4)	(5)	(6)
Regional inflation	0.508***	0.393***	0.386***	0.540***	0.412***	0.419***
	(0.0956)	(0.101)	(0.0980)	(0.0963)	(0.104)	(0.102)
Regional GDP growth		1.105			1.994	
		(3.166)			(3.177)	
Regional UE rate			0.0124			0.00626
			(0.0108)			(0.0124)
≥80% Exports × Regional inflation				-0.639***	-0.426	-0.681**
				(0.239)	(0.280)	(0.294)
≥80% Exports × Regional GDP growth					-16.57	
					(11.49)	
≥80% Exports × Regional UE rate						0.113**
						(0.0443)
Constant	1.613***	2.313***	2.295***	1.676***	2.371***	2.370***
	(0.596)	(0.630)	(0.611)	(0.580)	(0.615)	(0.583)
Observations	2323	2326	2326	2323	2326	2326
R^2	0.228	0.230	0.231	0.232	0.235	0.235
Country x time FE	Yes	Yes	Yes			
Country x time x export group FE				Yes	Yes	Yes

Notes: Regional inflation is measured by four-quarter backward-looking moving averages. Huber weights from regression (1) are applied. Heteroskedasticity-robust standard errors in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table A.13: Perceived euro area inflation target and realized inflation at different horizons

	Euro area inflation expectation							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$h=1$	$h=2$	$h=4$	$h=6$	$h=8$	$h=10$	$h=12$	$h=16$
Panel A: Country level								
Country inflation	0.144**	0.179**	0.237***	0.439***	0.498***	0.370***	0.427***	0.495***
	(0.0598)	(0.0629)	(0.0601)	(0.0713)	(0.0868)	(0.0853)	(0.110)	(0.137)
Constant	2.354***	2.277***	2.118***	1.523***	0.823**	0.927*	0.493	0.482
	(0.207)	(0.202)	(0.152)	(0.112)	(0.280)	(0.415)	(0.558)	(0.640)
Observations	12	12	12	11	11	11	11	11
R^2	0.141	0.197	0.289	0.430	0.689	0.365	0.425	0.462
Panel B: Regional level								
Regional inflation	0.237	0.231	0.120	0.436	0.704**	0.752**	0.642**	0.548
	(0.299)	(0.310)	(0.238)	(0.305)	(0.180)	(0.198)	(0.164)	(0.286)
Constant	2.189***	2.221***	2.383***	1.519*	0.103	-0.849	-0.590	0.185
	(0.330)	(0.318)	(0.269)	(0.605)	(0.557)	(0.803)	(0.672)	(1.076)
Observations	55	55	55	55	55	54	53	53
R^2	0.043	0.038	0.015	0.136	0.333	0.281	0.161	0.152
Panel C: Regional level, within countries								
Regional inflation	0.531	0.574	0.679*	0.733*	0.651*	0.615**	0.570**	0.668**
	(0.339)	(0.339)	(0.304)	(0.330)	(0.260)	(0.145)	(0.136)	(0.180)
Constant	1.562*	1.564*	1.231	0.736	0.299	-0.247	-0.251	-0.316
	(0.632)	(0.591)	(0.586)	(0.808)	(0.896)	(0.645)	(0.656)	(0.756)
Observations	55	55	55	55	55	54	53	53
R^2	0.433	0.444	0.457	0.465	0.450	0.470	0.486	0.474
Country x time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Country and regional inflation are measured by backward-looking moving averages $\frac{1}{H}\sum_{p=1}^{H}\pi_{t-p+1}$ and H is given in the second row of the table. Huber-robust regressions. Panel A uses heteroskedasticity-robust standard errors, Panels B and C use standard errors clustered by countries; shown in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table A.14: Predictors of firms' perceived inflation target

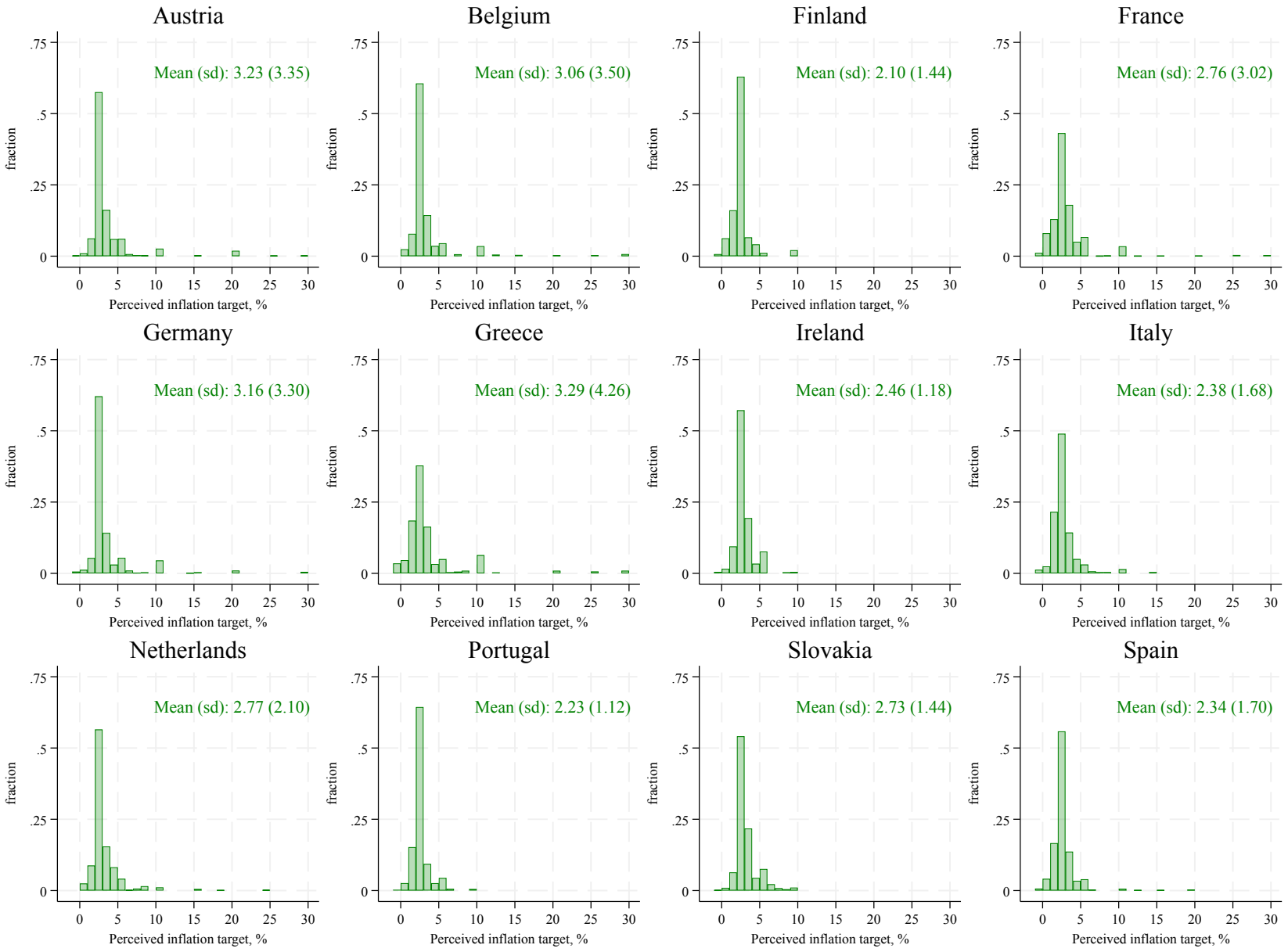
	Target $\neq$ 2%	Target	abs(Target $-$ 2%)
	Logit	OLS	OLS
	(1)	(2)	(3)
Employment			
From 1 employee to 9 employees	ref.	ref.	ref.
From 10 employees to 49 employees	-0.0468*	0.113	0.0742
	(0.0244)	(0.162)	(0.156)
From 50 employees to 249 employees	-0.115***	-0.126	-0.168
	(0.0271)	(0.177)	(0.171)
250 employees or more	-0.158***	-0.447***	-0.576***
	(0.0384)	(0.168)	(0.159)
Sector			
Industry	ref.	ref.	ref.
Construction	0.0574	0.375	0.413*
	(0.0463)	(0.231)	(0.224)
Trade	-0.0252	-0.212	-0.169
	(0.0432)	(0.146)	(0.140)
Services	0.0781*	0.0484	0.180
	(0.0400)	(0.191)	(0.183)
Firm age			
10 years or more	ref.	ref.	ref.
5 years or more but less than 10 years	0.109**	0.0695	0.0738
	(0.0515)	(0.162)	(0.151)
2 years or more but less than 5 years	0.174**	1.203*	1.088*
	(0.0745)	(0.634)	(0.619)
Less than 2 years	0.0644	1.087	0.895
	(0.103)	(0.785)	(0.732)
Country			
AT	ref.	ref.	ref.
BE	-0.0337	-0.105	-0.00298
	(0.0570)	(0.320)	(0.315)
DE	-0.0216	0.00894	0.0513
	(0.0497)	(0.291)	(0.288)
ES	0.0873*	-0.837***	-0.518**
	(0.0525)	(0.261)	(0.256)
FI	-0.147**	-1.165***	-0.791***
	(0.0741)	(0.287)	(0.279)
FR	0.112**	-0.356	0.134
	(0.0551)	(0.326)	(0.312)
GR	0.142**	0.0366	0.535
	(0.0558)	(0.395)	(0.367)

Table A.14 (continued): Predictors of firms' perceived inflation target

IE	-0.0158	-0.699**	-0.587**
	(0.0690)	(0.275)	(0.269)
IT	0.0681	-0.807***	-0.451*
	(0.0507)	(0.260)	(0.255)
NL	0.0148	-0.417	-0.339
	(0.0538)	(0.274)	(0.270)
PT	-0.0882*	-0.969***	-0.777***
	(0.0514)	(0.255)	(0.252)
SK	-0.00469	-0.452*	-0.425
	(0.0611)	(0.272)	(0.268)
Constant		3.289***	1.397***
		(0.316)	(0.311)
Observations	3988	3989	3989
Pseudo-R2	0.04		
Frequency of target $\neq$ 2%	0.53		
R-squared		0.0339	0.0345

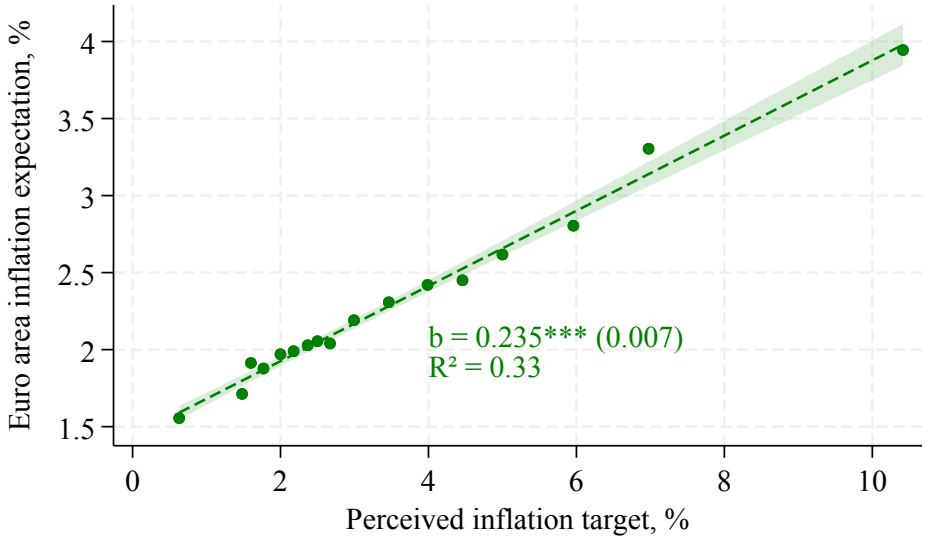
Notes: Column (1) shows the marginal effects from a logit regression of the indicator variable capturing that a firm's perceived inflation target is different from 2%. Columns (2) and (3) show the slope coefficients from OLS regressions of firms' perceived inflation target and the absolute deviation of their perceived targets and 2%, respectively. Heteroskedasticity-robust standard errors are shown in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Figure A.1: Histograms of perceived inflation targets by country



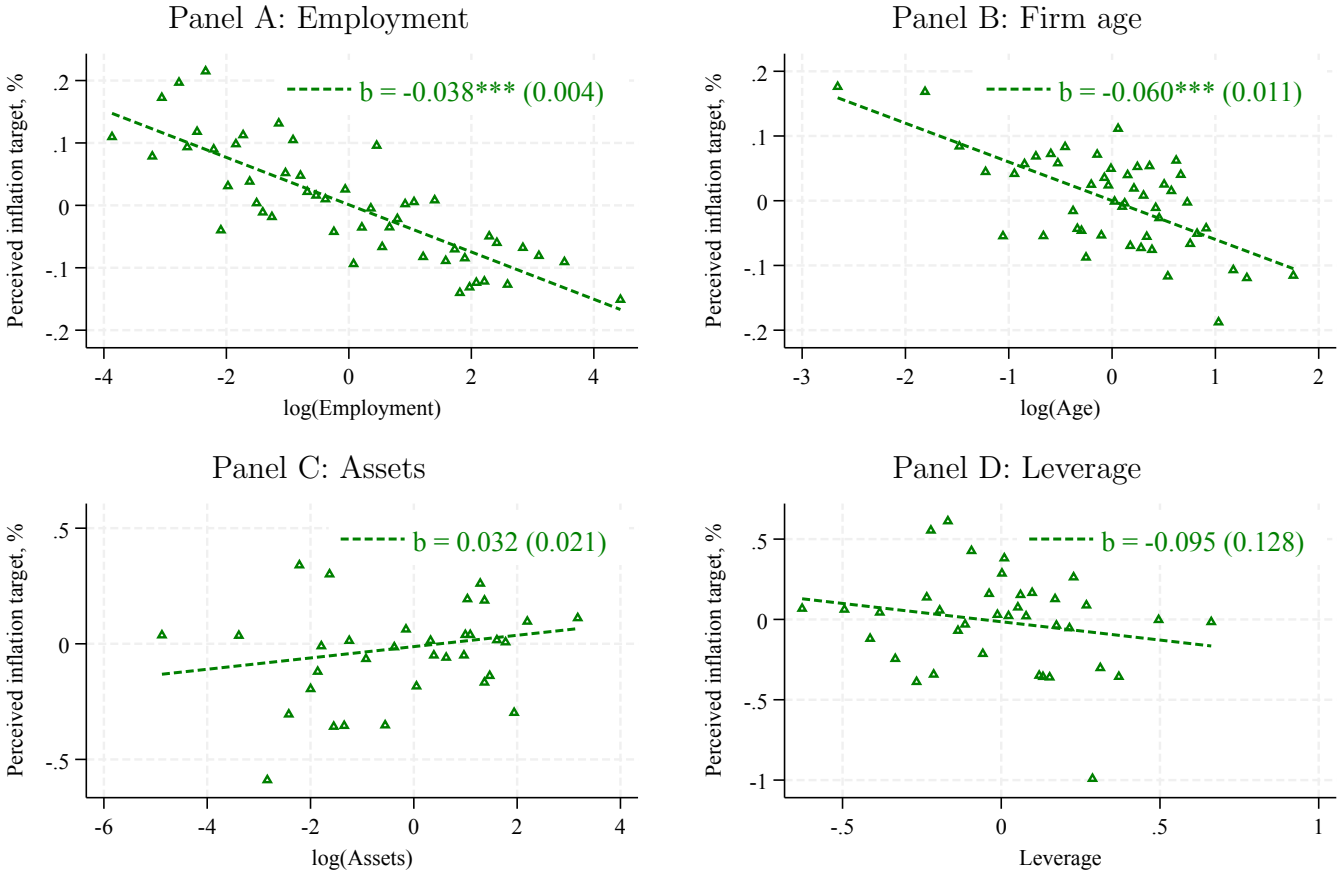
Notes: The histograms plot distributions based on control group responses for 2024Q4. Inflation expectations are trimmed at -1% and 30%.

Figure A.2: Perceived inflation target and euro area inflation expectations



Notes: The figure presents a binscatter plot of firms' perceived inflation target against their euro area inflation expectations. Huber weights are applied to minimize the influence of outliers.

Figure A.3: Binscatter plot of firm characteristics and perceived inflation target



Notes: The figure shows binned scatter plots of various firm characteristics against firms' perceived inflation target, with Huber weights and conditional on country, sector and time fixed effects.

B Additional model results and derivations

B.1 Derivations

Posterior beliefs. Given the information set of firm i (in country c and region r), $\mathbf{s}_{i,c,r} = [\pi^R_{c,r}, s^U_{i,c,r}, s^C_{i,c,r}]'$, the firm's expectation of π^U is given by

$$\begin{aligned}\mathbb{E}[\pi^U \mid \mathbf{s}_{i,c,r}] &= \mathbf{s}'_{i,r,c} \underbrace{\mathbb{E}[\mathbf{s}_{i,r,c}\mathbf{s}'_{i,r,c}]^{-1}\mathbb{E}[\mathbf{s}_{i,r,c}\pi^U]}_{\boldsymbol{\gamma}^U} \\ &= \gamma^U_R \pi^R_{c,r} + \gamma^U_U s^U_{i,r,c} + \gamma^U_C s^C_{i,r,c}.\end{aligned}$$

To obtain the weights $\boldsymbol{\gamma} = [\gamma_R, \gamma_U, \gamma_C]'$, we compute (omitting symmetric entries for legibility)

$$\begin{aligned}&\mathbb{E}[\mathbf{s}_{i,r,c}\mathbf{s}'_{i,r,c}]^{-1} \\ &= \mathbb{E}\left[\begin{bmatrix}\pi^R_{c,r}\\ s^U_{i,r,c}\\ s^C_{i,r,c}\end{bmatrix}[\pi^R_{c,r}, s^U_{i,r,c}, s^C_{i,r,c}]\right]^{-1} \\ &= \mathbb{E}\begin{bmatrix}(\pi^R_{c,r})^2 & \cdot & \cdot \\ s^U_{i,r,c}\pi^R_{c,r} & (s^U_{i,r,c})^2 & \cdot \\ s^C_{i,r,c}\pi^R_{c,r} & s^U_{i,r,c}s^C_{i,r,c} & (s^C_{i,r,c})^2\end{bmatrix}^{-1} \\ &= \begin{bmatrix}\sigma^2_U+\sigma^2_C+\sigma^2_R & \cdot & \cdot \\ \sigma^2_U & \sigma^2_U+\sigma^2_{\varepsilon,U} & \cdot \\ \sigma^2_U+\sigma^2_C & \sigma^2_U & \sigma^2_U+\sigma^2_C+\sigma^2_{\varepsilon,C}\end{bmatrix}^{-1} \\ &= \frac{1}{\Delta}\begin{bmatrix}\sigma^2_U\sigma^2_C+\sigma^2_C\sigma^2_{\varepsilon,U}+\sigma^2_U\sigma^2_{\varepsilon,C}+\sigma^2_U\sigma^2_{\varepsilon,U}+\sigma^2_{\varepsilon,C}\sigma^2_{\varepsilon,U} & \cdot & \cdot \\ -\sigma^2_U\sigma^2_{\varepsilon,C} & \sigma^2_C\sigma^2_R+\sigma^2_R\sigma^2_U+\sigma^2_C\sigma^2_{\varepsilon,C}+\sigma^2_R\sigma^2_{\varepsilon,C}+\sigma^2_U\sigma^2_{\varepsilon,C} & \cdot \\ -(\sigma^2_U\sigma^2_C+\sigma^2_C\sigma^2_{\varepsilon,U}+\sigma^2_U\sigma^2_{\varepsilon,U}) & -\sigma^2_R\sigma^2_U & \sigma^2_U\sigma^2_C+\sigma^2_U\sigma^2_R+\sigma^2_C\sigma^2_{\varepsilon,U}+\sigma^2_R\sigma^2_{\varepsilon,U}+\sigma^2_U\sigma^2_{\varepsilon,U}\end{bmatrix}\end{aligned}$$

where $\Delta := det(\mathbb{E}[\mathbf{s}_{i,r,c}\mathbf{s}'_{i,r,c}]) = \sigma^2_U\sigma^2_C\sigma^2_R+\sigma^2_U\sigma^2_C\sigma^2_{\varepsilon,C}+\sigma^2_U\sigma^2_R\sigma^2_{\varepsilon,U}+\sigma^2_U\sigma^2_R\sigma^2_{\varepsilon,C}+\sigma^2_U\sigma^2_{\varepsilon,U}\sigma^2_{\varepsilon,C}+\sigma^2_C\sigma^2_R\sigma^2_{\varepsilon,U}+\sigma^2_C\sigma^2_{\varepsilon,U}\sigma^2_{\varepsilon,C}+\sigma^2_R\sigma^2_{\varepsilon,U}\sigma^2_{\varepsilon,C}$. Moreover,

$$\mathbb{E}[\mathbf{s}_{i,r,c}\pi^U] = \begin{bmatrix}\sigma^2_U\\ \sigma^2_U\\ \sigma^2_U\end{bmatrix}.$$

Combining these results yields

$$\boldsymbol{\gamma} = \mathbb{E}[\mathbf{s}_{i,r,c}\mathbf{s}'_{i,r,c}]^{-1}\mathbb{E}[\mathbf{s}_{i,r,c}\pi^U] = \begin{bmatrix} \gamma_R \\ \gamma_U \\ \gamma_C \end{bmatrix} = \begin{bmatrix} \frac{\sigma_U^2\sigma_{\varepsilon,U}^2\sigma_{\varepsilon,C}^2}{\Delta} \\ \frac{\sigma_U^2(\sigma_C^2\sigma_R^2+\sigma_C^2\sigma_{\varepsilon,C}^2+\sigma_R^2\sigma_{\varepsilon,C}^2)}{\Delta} \\ \frac{\sigma_U^2\sigma_{\varepsilon,U}^2\sigma_R^2}{\Delta} \end{bmatrix}.$$

Note that if $\sigma_{\varepsilon,U}^2 \to 0$, i.e., the euro area signal becomes perfect, then $\boldsymbol{\gamma} \to (0,1,0)$.

Analogously, firms' expectation of country inflation π_c^C is given by

$$\begin{aligned}\mathbb{E}[\pi_c^C \mid \mathbf{s}_{i,r,c}] &= \mathbf{s}'_{i,r,c}\underbrace{\mathbb{E}[\mathbf{s}_{i,r,c}\mathbf{s}'_{i,r,c}]^{-1}\mathbb{E}[\mathbf{s}_{i,r,c}\pi^C]}_{\boldsymbol{\phi}} \\ &= \phi_R\pi_{c,r}^R + \phi_U s_{i,r,c}^U + \phi_C s_{i,r,c}^C.\end{aligned}$$

Since

$$\mathbb{E}[\mathbf{s}_{i,r,c}\pi^C] = \begin{bmatrix} \sigma_U^2+\sigma_C^2 \\ \sigma_U^2 \\ \sigma_U^2+\sigma_C^2 \end{bmatrix},$$

the weights are given by

$$\boldsymbol{\phi} = \begin{bmatrix} \phi_R \\ \phi_U \\ \phi_C \end{bmatrix} = \begin{bmatrix} \frac{\sigma_C^2\sigma_U^2\sigma_{\varepsilon,C}^2+\sigma_C^2\sigma_{\varepsilon,C}^2\sigma_{\varepsilon,U}^2+\sigma_U^2\sigma_{\varepsilon,U}^2\sigma_{\varepsilon,C}^2}{\Delta} \\ \frac{\sigma_U^2\sigma_R^2\sigma_{\varepsilon,C}^2}{\Delta} \\ \frac{\sigma_U^2\sigma_C^2\sigma_R^2+\sigma_C^2\sigma_R^2\sigma_{\varepsilon,U}^2+\sigma_U^2\sigma_R^2\sigma_{\varepsilon,U}^2}{\Delta} \end{bmatrix}.$$

Note here that if $\sigma_{\varepsilon,C}^2 \to 0$, i.e., the country signal becomes perfect, then $\boldsymbol{\phi} \to (0,0,1)$.

Relationship between euro area and national inflation expectations. Recall that

$$\begin{aligned}\mathbb{E}_{i,r,c}[\pi^U] &= \gamma_U s_{i,r,c}^U + \gamma_C s_{i,r,c}^C + \gamma_R\pi_{c,r}^R \\ \mathbb{E}_{i,r,c}[\pi^C] &= \phi_U s_{i,r,c}^U + \phi_C s_{i,r,c}^C + \phi_R\pi_{c,r}^R.\end{aligned}$$

We can solve the second equation for $\pi_{c,r}^R$,

$$\pi_{c,r}^R = \frac{1}{\phi_R}\left(\mathbb{E}_{i,r,c}[\pi^C] - \phi_U s_{i,r,c}^U - \phi_C s_{i,r,c}^C\right),$$

and substitute in the first equation to get

$$\mathbb{E}_{i,r,c}[\pi^U] = \gamma_U s_{i,r,c}^U + \gamma_C s_{i,r,c}^C + \frac{\gamma_R}{\phi_R}\left(\mathbb{E}_{i,r,c}[\pi^C] - \phi_U s_{i,r,c}^U - \phi_C s_{i,r,c}^C\right).$$

Simplifying yields

$$\mathbb{E}_{i,r,c}[\pi^U] = \underbrace{\frac{\gamma_R}{\phi_R}}_{\beta}\, \mathbb{E}_{i,r,c}[\pi^C] + \underbrace{\left(\gamma_U - \frac{\gamma_R}{\phi_R}\phi_U\right)}_{\delta^U} s^U_{i,r,c} + \underbrace{\left(\gamma_C - \frac{\gamma_R}{\phi_R}\phi_C\right)}_{\delta^C} s^C_{i,r,c},$$

where the coefficient of interest β is given by

$$\begin{aligned}
\beta &= \frac{\gamma_R}{\phi_R} \\
&= \frac{\sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_{\varepsilon,C}}{\sigma^2_C \sigma^2_U \sigma^2_{\varepsilon,C} + \sigma^2_C \sigma^2_{\varepsilon,C} \sigma^2_{\varepsilon,U} + \sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_{\varepsilon,C}} \\
&= \frac{\sigma^2_U \sigma^2_{\varepsilon,U}}{\sigma^2_C \sigma^2_U + \sigma^2_C \sigma^2_{\varepsilon,U} + \sigma^2_U \sigma^2_{\varepsilon,U}} \\
&= \frac{1}{\frac{\sigma^2_C \sigma^2_U + \sigma^2_C \sigma^2_{\varepsilon,U}}{\sigma^2_U \sigma^2_{\varepsilon,U}} + 1} \\
&= \frac{1}{1 + \frac{\sigma^2_C}{\sigma^2_U}\left(\frac{\sigma^2_U + \sigma^2_{\varepsilon,U}}{\sigma^2_{\varepsilon,U}}\right)} \\
&= \frac{1}{1 + \frac{\sigma^2_C}{\sigma^2_U}\left(1 + \frac{\sigma^2_U}{\sigma^2_{\varepsilon,U}}\right)}.
\end{aligned}$$

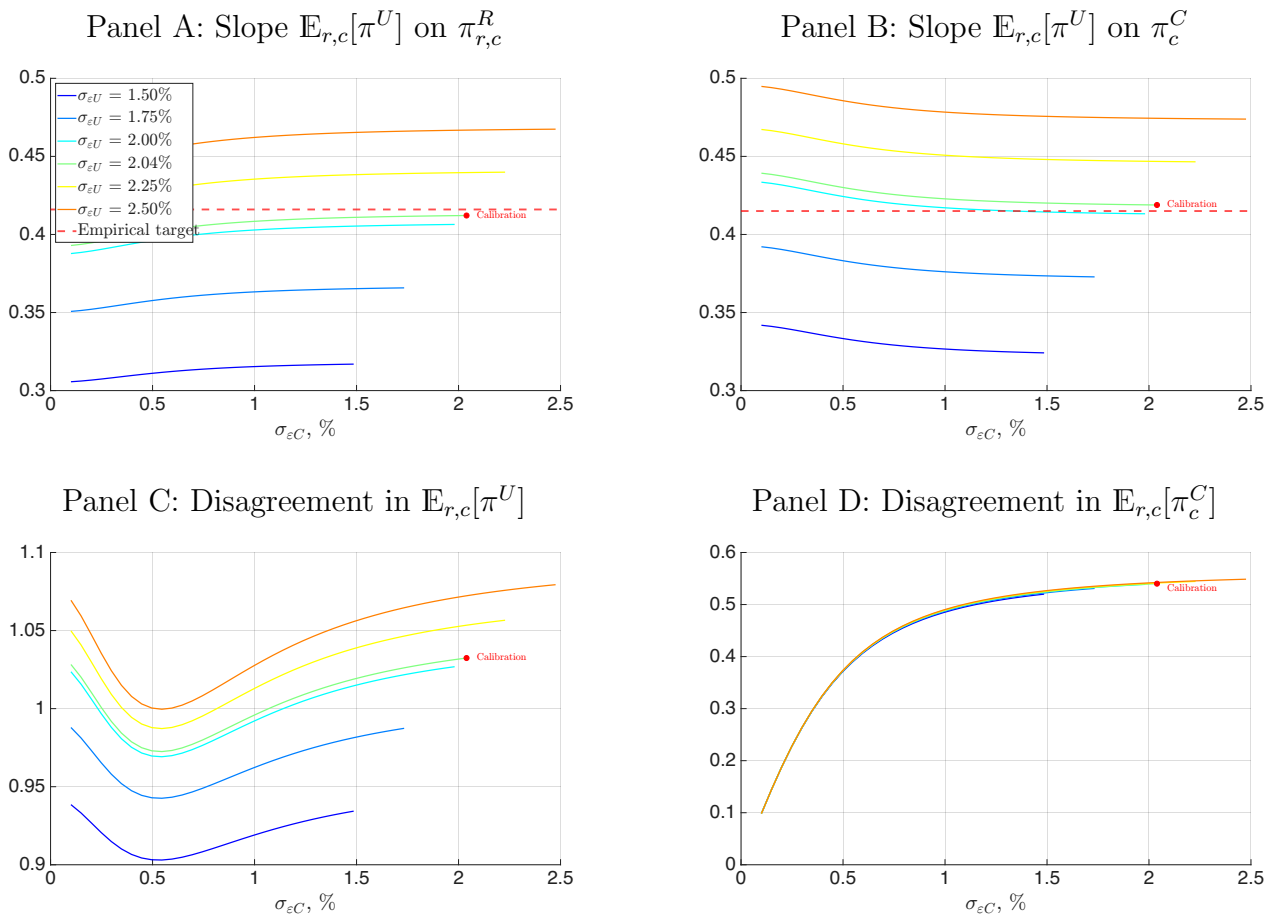
Note that if $\sigma^2_C \to 0$ then $\beta \to 1$. If $\sigma^2_{\varepsilon,U} \to 0$ then $\beta \to 0$ and $\mathbb{E}_{i,r,c}[\pi^U] = s^U_{i,r,c}$. Moreover, if $\sigma^2_{\varepsilon,U} \to \infty$ then $\beta \to \frac{1}{1+\frac{\sigma^2_C}{\sigma^2_U}}$.

We can also show that $\delta^C = 0$ since

$$\begin{aligned}
\Delta\delta^C &= \Delta(\gamma_C - \frac{\gamma_R}{\phi_R}\phi_C) \\
&= \sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_R - \frac{\sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_{\varepsilon,C}}{\sigma^2_C \sigma^2_U \sigma^2_{\varepsilon,C} + \sigma^2_C \sigma^2_{\varepsilon,C} \sigma^2_{\varepsilon,U} + \sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_{\varepsilon,C}} \left(\sigma^2_U \sigma^2_C \sigma^2_R + \sigma^2_C \sigma^2_R \sigma^2_{\varepsilon,U} + \sigma^2_U \sigma^2_R \sigma^2_{\varepsilon,U}\right) \\
&= \sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_R - \frac{\sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_{\varepsilon,C}}{\sigma^2_{\varepsilon,C}\left(\sigma^2_C \sigma^2_U + \sigma^2_C \sigma^2_{\varepsilon,U} + \sigma^2_U \sigma^2_{\varepsilon,U}\right)} \sigma^2_R \left(\sigma^2_C \sigma^2_U + \sigma^2_C \sigma^2_{\varepsilon,U} + \sigma^2_U \sigma^2_{\varepsilon,U}\right) \\
&= \sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_R - \sigma^2_U \sigma^2_{\varepsilon,U} \frac{\sigma^2_{\varepsilon,C}}{\sigma^2_{\varepsilon,C}} \sigma^2_R \frac{\sigma^2_C \sigma^2_U + \sigma^2_C \sigma^2_{\varepsilon,U} + \sigma^2_U \sigma^2_{\varepsilon,U}}{\sigma^2_C \sigma^2_U + \sigma^2_C \sigma^2_{\varepsilon,U} + \sigma^2_U \sigma^2_{\varepsilon,U}} \\
&= \sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_R - \sigma^2_U \sigma^2_{\varepsilon,U} \sigma^2_R \\
&= 0.
\end{aligned}$$

B.2 Details on model calibration

Figure B.1: Model sensitivity



Notes: This figure shows the values of various model moments on the y-axis, given different combinations of noise parameters $\sigma_{\varepsilon,U}$ (on different contour lines) and $\sigma_{\varepsilon,C}$ (on the x-axis). All other parameters are as in Panel A of Table 7. The empirical value of the respective moments are given by the dashed lines. The model moments implied by the calibration, where $\sigma_{\varepsilon,U} = \sigma_{\varepsilon,C} = 2.04\%$, are given by the dots.

B.3 Extended model covering RCT intervention

To capture the effects of an "RCT" in the model, we extend the baseline model with an additional signal about euro area inflation. The extended information set of a "treated firm" is $\mathbf{s}^*_{i,r,c} = [s^U_{i,r,c}, s^C_{i,r,c}, \pi^R_{r,c}, s^*_{i,c,r}]'$ where the information provided is perceived as a signal $s^*_{i,c,r} = \theta^U + \varepsilon^*_{i,c,r}$ with individual processing noise $\varepsilon^*_{i,c,r}$. This captures the empirical facts that (i) firms don't fully align their beliefs to the new signal and (ii) different firms with the same prior adjust their expectations to different extents. We assume that $\varepsilon^*_{i,c,r} \overset{iid}{\sim} \mathcal{N}(0, \sigma^2_*)$. The information set $\mathbf{s}^*_{i,r,c}$ gives rise to the "posterior beliefs", while the firm's information set before the "treatment", $\mathbf{s}_{i,r,c}$, generates the "prior beliefs".

To understand how providing the additional signal changes the euro area inflation expectation of firm i (in region r and country c), we compute, analogously to Appendix B.1, the firm's optimal expectation based on the four signals contained in $\mathbf{s}^*_{i,r,c}$. This yields a set of coefficients $[\gamma^U_R, \gamma^U_U, \gamma^U_C, \gamma^U_*]$ which determine

$$\mathbb{E}^*_{i,r,c}[\pi^U] = \gamma_U s^U_{i,r,c} + \gamma_C s^C_{i,r,c} + \gamma_R \pi^R_{c,r} + \gamma_* s^*, \tag{B.1}$$

where we call $\mathbb{E}^*_{i,r,c}$ the expectation having received the additional signal.[30]

We define the "treatment effect" of receiving the additional signal as

$$b = -\left(1 - \frac{Cov(\mathbb{E}^*_{i,r,c}[\pi^U], \mathbb{E}_{i,r,c}[\pi^U])}{Var(\mathbb{E}_{i,r,c}[\pi^U])}\right) \tag{B.2}$$

which maps into the coefficients b_j in the empirical specification (1).[31]

Given an estimated treatment effect in the data, and taking model parameters as given at the values in Table 7, we can back out the standard deviation of the noise in the "RCT" information, σ_*. Intuitively, if the signal is (perceived to be) perfect, firms would fully adjust and set inflation expectations exactly equal to the signal. Empirically, this is not the case, which implies $\sigma_* > 0$. The empirical treatment effect of providing the inflation forecast on euro area inflation expectations is $\hat{b}_2 = -0.53$ (see Table 3). Recovering this effect size in the model requires $\sigma_* = 1.14\%$.

Table B.1 shows how firms adjust the weights on their signals when the new information becomes available. Firms place a weight of 0.53 on the "RCT" signal, in line with the targeted treatment effect, and proportionally lower the weights on the euro area signal, country signal, and regional inflation by around a half.

Providing agents with additional information with relatively low noise reduces the disagreement about euro area inflation. In the model, prior disagreement falls by 23% from 1.03% to 0.79%.

[30] With some abuse of notation, we use the same notation $\gamma_R, \gamma_U, \gamma_C$ for the projection coefficients under the baseline and extended model, although the presence of the additional signal affects the values of those coefficients.

[31] When computing b, we hold the realizations of the signals $[s^U_{i,r,c}, s^C_{i,r,c}, \pi^R_{r,c}]$ constant across expectations $\mathbb{E}_{i,r,c}$ and $\mathbb{E}^*_{i,r,c}$ for a given (i, r, c).

Table B.1: Comparison of baseline (prior) and extended "RCT" (posterior) model

Panel A: Expectation weights				
Weight	Component	Prior	Posterior	Δ
γ_U	s^U (euro area signal)	0.35	0.16	-0.18
γ_C	s^C (country signal)	0.03	0.02	-0.02
γ_R	π^R (regional inflation)	0.39	0.18	-0.20
γ_*	s^* ("RCT" signal)	—	0.53	—
Panel B: Disagreement, data vs. model				
		Data	Model	
Prior disagreement		3.32%	1.03%	
Posterior disagreement		2.57%	0.79%	
Relative change		-23%	-23%	

Notes: Panel A shows the weights on firms' available signals when forming euro area inflation expectations. Prior weights refer to equation (9), posterior weights refer to equation (B.1). Panel B computes disagreement across firms based on the cross-sectional standard deviation in euro area inflation expectations (within countries).