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MAY 2024

ABSTRACT

SAFE to Update Inflation Expectations? New Survey Evidence on Euro Area Firms*

This paper provides new survey evidence on firms' inflation expectations in the euro area. Building on the ECB's Survey on the Access to Finance of Enterprises (SAFE), we introduce consistent measurement of inflation expectations across countries and shed new light on the properties and causal effects of these expectations. We find considerable heterogeneity in firms' inflation expectations and show that firms disagree about future inflation more than professional forecasters but less than households. We document that differences in firms' demographics, firms' choices and constraints, and cross-country macroeconomic environments account for most of the variation in inflation expectations by roughly equal shares. Using an RCT approach, we show that firms update their inflation expectations in a Bayesian manner. Moreover, they revise their plans regarding prices, wages, costs and employment in response to information treatments about current or future inflation.

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"[…] in the end, there is only one way that those shocks can lead to sustained inflation – and that is if monetary policy accommodates them and allows them to feed into inflation expectations."   ECB President Christine Lagarde, 2022

"Clear communication […] also helps households, firms, experts and markets to cut through the noise in the current highly uncertain environment and thereby helps to maintain the anchor for inflation expectations."
                    ECB Executive Board Member Philip R. Lane, 2022

"For euro area firms, evidence on inflation expectations remains scant"
                    ECB Executive Board Member Isabel Schnabel, 2023

1. Introduction

Inflation expectations represent a key variable for monetary policymakers. Given that firms take many decisions that influence macroeconomic outcomes, including setting prices, negotiating wages, deciding how much to invest and how many people to employ, their inflation expectations are of significant interest for monetary policy. Despite their importance, we still know relatively little about firms' inflation expectations in the euro area, partly owing to a lack of consistent measures across countries.[1] While some national firm surveys have, over time, been set up or expanded to cover inflation expectations, these surveys vary significantly in design and frequency thus making comparisons across countries difficult.[2] Consistent measurement across countries permits studying the properties of firms' aggregate inflation expectations in a heterogeneous monetary union. Therefore, addressing the lack of consistent information on firms' inflation expectations at the euro area level was also identified in the 2020-21 ECB monetary policy strategy review as one area for future research (Baumann et al. 2021, 2023). This paper introduces a new initiative to measure firms' inflation expectations and thus to shed more light on this critically important area.

In this paper, we build on the Survey on the Access to Finance of Enterprises (SAFE), a large euro area firm survey run by the European Central Bank (ECB) and the European Commission (EC), and provide novel results based on a recent expansion of the survey, which included questions on firms' inflation expectations and economic plans. The survey has a

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[1] Regarding the inflation expectations of euro area consumers – as other important economic agents –, the information gap was closed with the launch of the ECB's Consumer Expectations Survey (CES) in January 2020. The CES collects, using a panel structure, monthly data on consumers' inflation expectations for each of the six largest euro area economies (namely, Germany, France, Italy, Spain, the Netherlands and Belgium), covering about 10,000 households.

2 The first national firm survey in the euro area was introduced in Italy in 1999, and more recently surveys were started also in Germany and France.

number of desirable features in addition to measuring inflation expectations of firms, in line with recommendations in Coibion et al. (2020): First, the survey relies on a representative sample of firms rather than a convenience sample. As a result, it covers a highly heterogenous spectrum of firms in terms of age, size, ownership, industry, location, export status, managerial characteristics, etc. Importantly, the survey asks managers to respond on behalf of their firm, thus it ensures that the collected information represents well the views of those who typically influence firms' actions. Second, the sample size is large (~6,000 firms) which allows meaningful subsample analysis and relatively precise estimates even for narrowly defined groups of firms. Third, the survey features a panel component which allows us to track individual firms over time and thus observe the evolution of their beliefs and actions. Fourth, going forward, the survey will elicit firms' inflation expectations and economic plans at the quarterly frequency, allowing for a timely measurement. The survey obtains not only point predictions of inflation at multiple horizons via open-ended questions (which minimise priming of the responses) but also firms' views about uncertainty underlying the inflation outlook. Fifth, during an initial pilot phase, the survey collected both national and euro area expectations, thus allowing to analyse their commonalities and differences. Sixth, the survey offers consistent measurement of expectations across countries in a monetary union, which opens a number of avenues for research and policy analysis. Seventh, the richness of the survey (which has many questions about various choices and subjective perceptions and outlook at the firm and aggregate level) is amplified by the ability to link the survey to administrative data (e.g., the Orbis database). Finally, the survey is potentially open to introducing ad hoc modules (which may include randomised controlled trials) to inform policymakers about pressing questions in real time.

In line with earlier evidence, we find that firms have highly heterogeneous inflation expectations that are distinct from the expectations of professional forecasters and households. We document that in June 2023 firms had elevated inflation expectations (well above the inflation target of the ECB, though not far from actual inflation at that time) but firms also projected a decline of inflation over the longer run. Moreover, firms were quite uncertain in their inflation outlook. These features of the data are of direct interest to central banks that are adjusting monetary policy to bring inflation back to target over the medium term. We show that there is systematic variation in inflation expectations along firm and manager characteristics (e.g., size, age, financial conditions and gender) with the business environment playing a large role in accounting for cross-sectional variation in beliefs. Furthermore, we find

that local conditions such as the national rate of inflation predict not only national inflation expectations but also euro area inflation expectations. In other words, firms extrapolate from local conditions to aggregate conditions.

To establish causal effects of inflation expectations on firms' choices as well as to gauge the power of policy communication, we run a randomised controlled trial (RCT). Specifically, we implement information treatments with past inflation and with inflation forecasts to randomly chosen firms. We find that, even in the high-inflation environment of June 2023, these information treatments have large and persistent effects on inflation expectations. For example, treating firms with an inflation forecast affects their beliefs even six months after the treatment. We also show that providing forward-looking information appears to have somewhat stronger effects on firms' expectations than backward-looking information. These results suggest that policy communication has the potential to steer inflation expectations. In addition, we document that exogenous variation in inflation expectations translates into firms' plans to change prices, wages, costs, and employment. For example, we find that a 1 percentage point increase in inflation expectations causes firms to plan a 0.3 percent increase in their selling prices; that is, the "pass-through" of inflation expectations to prices is 30%. Although our sample size is not large enough to precisely estimate the persistence of the effects on these choices, we present evidence suggesting that plans and subsequent actions are closely related so that one may expect that beliefs about inflation indeed alter the behaviour of firms.

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 at a critical inflation-wise junction for many countries (recall that high-quality surveys of firms' inflation expectations are rather rare) 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. 2021) and beyond (e.g., Candia et al. 2024). In this context, we expand the list of countries, implement consistent measurement across countries, and offer a novel survey question to elicit uncertainty. We also provide additional moments to inform theoretical exercises modelling the formation of expectations.

Second, we systematically study predictors of firms' inflation expectations and uncertainty. 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 the SAFE, we investigate

the predictive power of various firm and manager 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).

Third, we contribute to a rapidly growing literature on measuring causal effects of information treatments on expectations and choices of households and firms (see e.g., Drager et al. 2023). Our RCT provides estimates of firms' responses in a high-inflation environment for developed countries. These estimates are novel and important because the vast majority of previous studies for advanced economies provided estimates in low inflation settings (e.g., Coibion et al. 2022, Savignac et al. 2021). Weber et al. (2023) show that the impact of inflation-related information treatments on expectations varies systematically with the level of inflation. Thus, we provide not only a timely estimate for policymakers interested in using policy communication to contain inflation but also give a highly informative data point for models emphasizing incentives for information acquisition and processing.

The rest of the paper is structured as follows. Section 2 lays out key details of the survey such as survey questions, sampling, validation, etc. Section 3 documents properties of inflation expectations. We report basic moments but also correlations of firms' inflation expectations and uncertainty with various firm characteristics. Section 4 focuses on the RCT component of the survey. This section establishes causal effects of information treatments on beliefs and choices of firms. Section 5 concludes.

2. The Survey on the Access to Finance of Enterprises (SAFE)

The Survey on Access to Finance of Enterprises 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 (EC), covering all EU and some EU neighbouring countries (covering 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, 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 its access to finance (Appendix Table 1 provides some descriptive statistics, Appendix Table 3 provides an overview of the main variables covered in the SAFE). 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 enterprises (SMEs). Firms in the sample are randomly selected from the Dun & Bradstreet business register. The sample is stratified by country, enterprise size class, and economic activity and the sample size is chosen to ensure a satisfactory representation across activities and size classes. The derived statistics are then computed using appropriate survey weights that reflect the proportions of the economic weight (in terms of number of employees) of each size class, economic activity, and country.[3]

In the existing survey rounds, the fieldwork usually runs over a period of six weeks, while the new survey rounds have a slightly shorter fieldwork period of about four weeks. Currently the survey is carried out on behalf of the ECB and the EC by Verian, in cooperation with the fieldwork provider GDCC. They are conducted predominantly by telephone, with about 20% of respondents filling in an online questionnaire.

The sample includes a rotating panel of enterprises. A company is classified as a panel member if it participated in the survey at least twice, though not necessarily in consecutive waves. In the survey rounds in 2023, the average percentage of panel firms reached 80% of the overall number of surveyed firms. However, the average percentage of firms present in at least two consecutive survey rounds is much lower, at around 30%.

A. Questions on 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 financing of firms. Because this new module is a pilot, one should view the collected data as experimental.

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. Two follow-up waves were implemented in September 2023 (a regular wave of SAFE

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[3] See <u>Methodological information on the survey and user guide for the anonymised micro dataset</u>, June 2023, for further methodological information on the SAFE.

with 11,523 firms) and December 2023 (this wave includes a similar experimental module and reached 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. Although existing research (for example Savignac et al. 2021) found that firms' responses are highly correlated over different horizons, their levels can differ significantly, so it is of great interest to collect expectations at several horizons. Moreover, in situations of rapid movements in inflation (such as the sharp rise in inflation as observed in 2022/23 across many economies), it is crucial to gauge the expected persistence of inflation over time. Apart from assessing how anchored inflation expectations are (e.g., long-term inflation expectations should be closer to the inflation target than short-term expectations), the profile of expectations along time horizons can inform policymakers about how quickly firms expect inflation to normalise. The wording of the question asked in May-June 2023 was as follows:

> *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*

These questions do not specify the price index for inflation. While there is some variation in this dimension across firm-level surveys and one should weakly prefer asking about a specific price index, we opted for a "general" inflation question. As we discuss later, we also ask subsets of firms to report their national inflation rates and managers may be less aware of country-level specific price indices. In any case, interviewers had been instructed to provide additional clarification to all respondents that the intended price index is the Harmonised Index of Consumer Prices (HICP).[4] The questions about inflation expectations at medium- to long-term horizons are phrased for specific calendar years to avoid confusion about whether the question is about average inflation over several years or about the future rate after several years.

Initially, firms were not provided with further information, for example about recent inflation outturns, to avoid nudging their answers in a certain direction.[5] Previous research has

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[4] 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."
[5] 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 3.

shown that priming firms with such information affects the level and dispersion of inflation forecasts (see Coibion, Gorodnichenko and Ropele, 2020).

In addition to the questions on point forecasts, firms were asked about the uncertainty attached to various inflation outcomes at the five-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 a flexible, self-reported scenarios (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. The question was phrased as follows:

> *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 $1.5 \times$ $point\ prediction$ and p_{low} is the probability assigned to $0.5 \times point\ prediction$.[6]

While this question does not extract a complete subjective probability distribution, it has several benefits. In addition to being simple, the question measures the probabilities that respondents assign to tail events. This is important because, as discussed in Reis (2021), tails are the first to move when inflation is unstable. Furthermore, this question does not use a fixed grid and instead the ranges vary with the expected level of inflation that each firm reports. This consideration is important in environments with potentially high and volatile inflation that conduce bunching of survey responses at top backets.[7] As a result, the survey responses can become less informative. Finally, because fixed bins can prime respondents' responses (see Coibion et al. 2020), the sliding scale of offered scenarios in our question should attenuate concerns about priming.

B. Randomisation

To allow for a randomised information treatment of certain groups of firms, the survey module on firms' inflation expectations consists of three stages, which are summarised in Figure 1.

Stage 1: Survey questions, pre-treatment. In the first stage, firms were randomly assigned to one of four groups, with 25% of the sample assigned to each group. 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 question Q1 stated above about their expectations regarding euro area inflation, while group 4 was asked about their expectations regarding the inflation rate in their country, where "What do you think the euro area inflation rate will be […]" was replaced by "What do you think the inflation rate will be in your country […]". We verify that observable firm and manager characterises do not predict group assignment (Appendix Table 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 treatments. 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

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[6] CV is approximately equal to the standard deviation of the log of the variable of interest. This measure should be less sensitive to the level of the forecasted variable which is important when inflation gets high.

[7] For example, the Survey of Professional Forecasters of the Federal Reserve Bank of Philadelphia (SPF-PF) uses "4.0 or more" as the top bracket for core CPI inflation expectations. In 2022Q4, the average weight assigned to this bin was 91% and 56% of respondents assigned 100% weight to this bin.

inflation outturn, which referred to the month of April 2023, where inflation stood at 7.0%.[8]
Firms in group 2 were provided with the latest available expert inflation expectations in twelve
months as gauged using the European Central Bank's Survey of Professional forecasters.[9] The
number provided 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 question Q1 above about their baseline 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. In addition, firms in groups 1-4 were asked question Q2 above about the
uncertainty attached to specific inflation outcomes at the 5-year (i.e., long-term) horizon below
or above their mean expectation.

C. 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-labour
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-labour costs such as materials and energy)*
> *c) The average wage of your current employees*
> *d) Your number of employees*

D. Questions about inflation and economic plans in the follow-up waves

The regular September 2023 wave of the SAFE, conducted three months after the June 2023
pilot wave, included the same questions on economic plans as outlined above, thus allowing to
assess the persistence of inflation treatment effects on economic plans. The September wave

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[8] 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%."
[9] 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%."

did not include questions on inflation expectations. A second pilot wave was then conducted in December 2023, which included the same questions as above on euro area inflation expectations (and for a small subset of firms, on national inflation expectations), inflation uncertainty and economic plans (see Figure 1). In addition, to assess the impact of earlier information treatments on subsequent economic actions, the December pilot wave also included the following questions on actions that firms reported having taken:

> *Over the past 6 months, by how much have the following increased or decreased? 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-labour costs such as materials and energy)*
> *c)   The average wage of your current employees*
> *d)   Your number of employees*

E. 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. In terms of scope, the prevailing questionnaire was already relatively long, requiring 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, with – at the extreme – some firms declining to take part in future waves of the survey altogether. This meant that 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 the 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 optimise the questions, the pilot phase included a careful validation exercise.

This validation exercise covered 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. These areas of validation of course complement the broader assessment of the economic information content of the responses, which we describe in Sections 3 and 4.

As regards benchmarking, other firm surveys that contain questions on inflation expectations in the euro area are available for Germany, France, and Italy, and are run by the

Bundesbank, Banque de France, and Banca d'Italia, respectively. Appendix Table 2 summarises the main survey features. 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. For example, 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 about uncertainty attributed to various inflation outcomes. In addition, there are also differences across these surveys in terms of survey mode (the French survey is entirely done via telephone, the German survey purely online, while the Italian survey uses a mixed, though predominantly online survey mode), outlier treatment as well as size thresholds for firm coverage.

The SAFE interview recordings showed a wide divergence in the extent to which firms 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 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, or they seemed to interpret the question as referring to a cumulative rate, thus providing an expected rate that is increasing with the length of the horizon. Overall, these challenges were also reflected in a lower response rate for the questions on inflation expectations (with a non-response rate of 32%) 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%.[10]

F. Data filters/outlier treatment

Throughout this paper, to ensure that our analysis is not driven by outliers, we trim inflation expectations at all horizons at -1% and 30%. This affects about 1% to 3% of observations depending on the horizon. We winsorise firms' plans about prices, costs, wages, and

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[10] In view of the difficulty that firms encountered particularly answering the question about inflation uncertainty, after the completion of the pilot phase, we rephrased 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].

employment at the 2% and 98% percentiles of the respective distributions. We eliminate firms' subjective probabilities if they add up to more than 100% (this applies to 7% of the sample).

3. Properties of Inflation Expectations

A. Moments

Basic moments of inflation expectations for the euro area by horizon and country are reported in Table 1. Figure 2 plots the distribution of inflation expectations. The average 1-year-ahead forecast is 5.8 percent which is a notch above actual inflation at the time of the survey (5.5 percent in June 2023). The rate of expected inflation falls with the forecast horizon to 5.0 and 4.8 percent for 3- and 5-year-ahead forecasts, respectively. The disagreement (which is measured by the cross-sectional standard deviation) is relatively high and increases with the horizon: 2.95 percent for 1-year-ahead forecasts and 4.99 percent for 5-year-ahead forecasts. Thus, although firms expect inflation to moderate over time, firms have increasingly divergent views on where inflation is going to land in the longer run.

To benchmark these magnitudes, in Table 1, 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 ECB 2023).[11] Consistent with Candia et al. (2022), we observe that the moments of managers' inflation point forecasts are between those of households and professional forecasters. That is, firms' average expectations are higher than professional forecasters' and are close to households'. At the same time, firms' expectations exhibit more disagreement than professional forecasters' and less than households'.

There is considerable variation in these moments across countries. 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 when inflation expectations are high on average for all forecast horizons, some countries have high disagreement even when inflation forecasts are low (e.g., Spain). Interestingly, country-level

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[11] Comparing with national firm surveys, predictions in 2023Q2 for firms' inflation expectations are 5.8% and 4.5%, for the 1-year and 3-5 year horizons (weighted means) in Italy, respectively; 4.0% and 3.0% for the 1-year and 3-5 year horizons (medians), respectively, in France; and 6.1%, 5.0%, and 4.7%, at the 1-year, 3-year and 5-year horizons (averages), respectively, in Germany, based on the surveys run by the Banca d'Italia, Bundesbank, and Banque de France.

average forecasts tend to become more similar as the forecast horizon increases (Appendix Figure 3). This pattern suggests that firms expect inflation to converge across countries.

B. Short- vs. longer-term inflation expectations

Panels A and B in Figure 3 document that longer-term inflation expectations are strongly correlated with short-term expectations, which can serve as a metric for how anchored inflation expectations are (Kumar et al. 2015). This holds for both euro area and national inflation. However, the strength of the correlation as well as the "pass-through"[12] from short- to long-term inflation expectations declines with the forecast horizon, with the pass-through standing at 0.6 for 3-year-ahead forecasts and 0.4 for 5-year-ahead forecasts. For comparison, the pass-through was estimated at 0.7 for New Zealand (Kumar et al. 2015) and for the US (Candia et al. 2021) in low-inflation settings.

C. Uncertainty in inflation expectations

While high inflation is generally associated with high uncertainty about inflation, it is important to establish how subjective probability distributions and especially their tails change with inflation (e.g., Reis (2021) argues that the tails of inflation expectations could be valuable leading indicators of inflation and thus deserve particular attention). Panel A of Table 2 presents summary statistics for various measures of uncertainty in 5-year-ahead inflation forecasts. Generally, firms are fairly uncertain.[13] Consistent with other surveys, standard deviation of point forecasts that indicates disagreement (column 10 in Table 1) is discernibly higher than standard deviation in uncertainty (column 4 in Table 2). This pattern is important because it is inconsistent with the basic noisy information model (e.g., Sims 2003) and it calls for variation in "long-term" priors about inflation (see Coibion et al. 2021). There is also apparent cross-country variation in average CV implied by reported subjective probability distributions: CV ranges from 0.28 in Belgium to 0.42 in Greece. Columns (6) and (8) of Table 2 and Panel A of Figure 4 document that the right tail of the subjective probability distributions is thicker than the left tail. In other words, firms expect a higher upside risk in inflation. Panel C 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

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[12] The "pass-through" is measured with the estimated slope in the regression where a long-term inflation expectation is the dependent variable and a short-term inflation expectation is the regressor.

[13] Similar to households, firms often report expectations in multiples of 5 (also see Appendix Table 4), which can signal uncertainty about their expectations (Binder 2017).

firms expecting some mean reversion in inflation. This pattern can also rationalise why our CV measure ($CV = \sqrt{(p_{high} + p_{low})/2}$)) is only weakly correlated with the level of inflation (Panel E of Figure 4) as changes in the tails roughly offset each other.

D. Expectations for national inflation

The famous Lucas (1972) island model and subsequent research emphasise that economic agents can extrapolate from local conditions to predict aggregate outcomes. For example, Andrade et al. (2022) document that aggregate inflation expectations of French firms are predicted by industry-specific idiosyncratic shocks. Given the unique nature of the SAFE, we can explore if predictions for *national* inflation are related to predictions for *euro area* inflation and thus directly contribute to this research agenda. In other words, we can investigate if firms in a country with relatively high inflation also have relatively high inflation expectations not only for national inflation but also for "aggregate" euro area inflation. The relationship between local and euro area inflation expectations is also relevant for inflation dynamics in monetary unions.

We report moments for national inflation expectations (Table 3) and compare distributions of national and euro area 1-year-ahead inflation expectations (Figure 5).[14] The properties are qualitatively similar (i.e., levels and dispersions as well as uncertainty are in the same ballpark). The country-level average 1-year-ahead forecast for national inflation is strongly correlated both with actual inflation ($\rho = 0.82$) and with the average 1-year-ahead forecast for euro area inflation ($\rho = 0.91$). These correlations suggest that "aggregate" euro area expectations may be shaped by country-level experiences in a manner akin to the island model. One can also notice that countries with relatively low (high) actual inflation data tend to have higher (lower) euro area inflation expectations than national ones. For example, while Slovakian firms expect 9.9 percent inflation for Slovakia over the next twelve months in June 2023, they predict lower (8.55 percent) inflation for the euro area. In contrast, Belgian firms project 5.16 percent inflation in the euro area which is higher than their national forecast of 4.58 percent. This pattern suggests that firms expect convergence of national inflation to euro area inflation.

E. Predictors of inflation expectations

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[14] Results for longer-term inflation forecasts are reported in Appendix Figure 1 and Appendix Figure 2.

Although previous literature (see D'Acunto et al. 2023 for a survey) has extensively studied predictors (age, gender, education, etc.) of cross-sectional variation in households' inflation expectation, there is relatively little evidence on what accounts for similar variation across firms. 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. As a result, it is not clear whether, for example, personal views of managers or the business environment account for the observed dispersion in inflation expectations. In contrast to earlier studies, the richness of SAFE allows to provide new insights on the matter.

As a first pass at the data, we examine the bilateral relations between selected firm characteristics and inflation expectations in the form of binned scatter plots, in part derived from linking SAFE data to the Orbis database (Figure 6). There is a negative relationship between the size of a firm (measured either with total assets or employment) and inflation expectations, which is in line with evidence from other surveys (e.g., McClure et al. 2022). 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, and so do firms with increasing financing needs and financing gaps (i.e., the difference between the change in financing needs and that in the availability of finance). By contrast, firms that experience an increased availability of finance tend to report lower 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 financially constrained firms who rely more on external financing and are therefore more exposed to an increase in interest rates than unconstrained firms, increase their inflation expectations by more after a monetary policy shock. This could reflect that they expect a relatively larger increase in debt servicing costs after an increase in interest rates.

When we regress inflation expectations on a broader set of characteristics, we find qualitatively similar results (Appendix Table 6). Consistent with earlier evidence for firms and households (e.g., D'Acunto et al. 2021, Savignac et al. 2022), we find that men and chief financial officers tend to have relatively lower inflation expectations. Interestingly, there is no clear difference in expectations across sectors. Some of firms' outlook and constraints have predictive power (e.g., firm-specific expectations about their cost increases) but many variables in this block do not appear to have a strong association with inflation expectations when we control for other factors.

To make further progress in quantifying the relative contributions of various characteristics, we consider several blocks of variables that can shape inflation expectations. The first block covers variables describing managers such as their gender and positions within firms. The second block includes firm demographics such as age, sector, size, etc. The third block consists of variables describing firms' constraints and outlook such as investment plans, leverage and access to credit. Finally, we consider sector and country fixed effects and a set of technical variables such as interview duration and survey mode (phone or online). 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).

We find (Columns (2), (4) and (6) in Table 4) that firms demographics and firms' choices and constraints have the largest contribution (approximately 30% each) to the total R^2 for inflation expectations across horizons (except at the 1-year horizon where country effects play a relatively larger role). The same pattern applies for uncertainty (columns (8) and (10)). The high share of R^2 accounted for by choices/constraints is consistent with the notion that firms' attention (and hence inflation expectations) could be jointly determined with other firm decisions. For example, Gorodnichenko (2007), Alvarez et al. (2011) and others develop models where firms' decisions to acquire information depend on whether firms also plan to reset their prices. On the empirical front, Coibion et al. (2018) document that firms facing higher competition tend to have better inflation forecasts. Thus, these high shares can point to rational inattention as a potential source of cross-sectional variation.

The share of R^2 accounted for by manager characteristics is about 13% for 1-year-ahead forecasts but the share increases in the forecast horizon. This pattern is qualitatively consistent with earlier studies (e.g., Coibion et al. 2018) documenting that firm characteristics are more important than manager characteristics in accounting for cross-sectional variation of firms' inflation expectations. In part, this may reflect the compressed dispersion of manager characteristics (e.g., they tend to be more educated, older, and male than the general population) but this can also capture the fact that the business environment rather than managers' personal traits is more important for firm performance and hence inflation expectations.

The share of country fixed effects in total R^2 is 58% for 1-year-ahead inflation forecasts, but strongly decreasing in the forecast horizon, and about 42% for uncertainty. These large shares suggest that euro area inflation expectations of firms can be affected by their country's macroeconomic environment. In other words, as we discussed above, firms could extrapolate

from their local conditions to aggregate expectations, which is consistent with industry-level evidence for French firms (Andrade et al. 2022). Interestingly, the importance of country fixed effects decreases in the forecast horizon, thus suggesting that firms anticipate convergence of their country-level inflation to the euro area level of inflation.

4. Treatment effects

So far we focused on documenting various moments and correlations in the data. While informative, this analysis does not establish causal relationships. To shed more light on how firms update beliefs and act on these beliefs, we now turn to the RCT component of our study.

A. Beliefs

We first examine how firms revise their inflation expectations in response to the provided signals. Figure 7 shows the distribution of revisions for the two treatment groups by forecast horizon.[15] We observe several key patterns. First, approximately half of the respondents choose to not revise their forecasts in response to the treatments, which may be elevated due to the wording of the question (recall that respondents are offered an opportunity to revise their responses after a treatment). Furthermore, the share of no-changes increases in the forecast horizon. Second, there is wide dispersion of revisions (the standard deviation is approximately 2.2 percentage points) which is relatively stable across the horizons and approximately symmetric around zero. This finding suggests that treatments can move beliefs in both directions. Third, the inflation forecast treatment lowers short-term (1-year-ahead) inflation expectations by approximately one percentage point on average. This large revision of inflation expectations is comparable to the large post-treatment revisions observed for firms in Italy and France (Coibion et al. 2020, Savignac et al. 2021). The magnitude of the revision, however, decreases along the forecast horizon and for the 5-year-ahead horizon the average revision is -0.6 percentage point, which is also consistent with evidence for Italian and French firms. At the same time, the treatment with actual inflation tends to have small average effects, which could point to economic agents being aware of inflation data in high-inflation environments (Weber et al. 2023). That is, inflation forecasts appear to be less known to firm managers.

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[15] Appendix Figure 6 plots the distribution of posterior inflation expectations by country and treatment group.

These averages, however, can mask significant changes in inflation expectations at the firm level.[16] To further explore the treatment effects on beliefs, we follow Coibion et al. (2022) and use the following specification:

$$E_{i,t}^{post}\pi_{t+h} = a_0 + a_1 \times E_{i,t}^{prior}\pi_{t+h} + \sum_j b_j \times E_{i,t}^{prior}\pi_{t+h} \times \mathbb{I}(i \in Treatment\ j) \qquad (1)$$

$$+ \sum_j c_j \times \mathbb{I}(i \in Treatment\ j) + controls + error$$

where $E_{i,t}^{prior}\pi_{t+h}$ is the pre-treatment (prior) inflation expectation for firm i and horizon h, $E_{i,t}^{post}\pi_{t+h}$ is the corresponding post-treatment (posterior) inflation expectation, and $\mathbb{I}(i \in Treatment\ j)$ is an indicator variable equal to one if firm i is in treatment group $j = \{Inflation\ Forecast, Actual\ inflation\}$. Note that for the control group there is no follow-up question to measure posterior beliefs and we impose $E_{i,t}^{post}\pi_{t+h} = E_{i,t}^{prior}\pi_{t+h}$; that is, $a_0 = 0$ and $a_1 = 1$ by construction. 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 $b_j \in [-1,0]$. In a similar spirit, the coefficients a_j measure the level effect 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 inflation 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 in these specifications to tighten the precision of estimates for b_j and a_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.

Panel A of Table 5 reports the estimates immediately after the treatments and Figure 8 presents the binscatter plots that correspond to specification (1). We find that, consistent with Bayesian learning, treatments move inflation expectations significantly across the horizons.

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[16] For instance, suppose that firm A expects 1% inflation and firm B expects 9% inflation. If the firms are provided with a 5% inflation forecast and revise their beliefs to 3% and 7% respectively, the average expectation remains the same although the treatment has a clear effect on beliefs.

This happens despite the fact that the survey was done in a high-inflation setting in which economic agents should be more aware of publicly available information such as past inflation statistics, current inflation forecasts, and the inflation target of the central bank (Weber et al. 2023). 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. Consistent with Coibion et al. (2020), we observe that the strength of the slope effect declines with the forecast horizon (especially for OLS estimates). This finding is consistent with the view that short-term inflation indicators such as 1-year ahead inflation forecasts or the current inflation rate have a smaller impact on long-term inflation expectations. The results are broadly similar when we restrict the sample to specific sectors or countries. Including controls such as firm size, age, export status, etc. does not affect estimates materially.

To assess the persistence of the effects from our information treatments, we estimate specification (1) with the dependent variable being inflation expectations collected six months later in the December 2023 wave of the survey (Panel B of Table 5). Although the sample is considerably smaller, we continue to find some significant effects (especially for the treatment with inflation forecasts). These results suggest not only a powerful, long-lived effect of the treatments but also limited survey demand effects in the estimates based on the measurement of posteriors immediately after the treatment.

Our findings indicate that policy communication has considerable potential to shape inflation expectations of firms even in a high-inflation environment when firms likely pay significant attention to inflation. For example, using an RCT on German households, Drager et al. (2023) document that informing households about inflation forecasts can help contain spillovers from high inflation into inflation expectations. Our findings indicate that policymakers can use the same tool for firms to contain their inflation expectations.

B. Uncertainty

Results in the previous section suggest that information treatments reduce the cross-sectional dispersion of beliefs. In the next step, we investigate whether information treatments also affect uncertainty in firms' long-term inflation forecasts. Because uncertainty is elicited only after information treatments, we need to modify specification (1) to

$$Uncertainty_{i,t+h} = c_0 + \sum_j c_j \times \mathbb{I}(i \in Treatment\ j) + controls + error. \qquad (2)$$

This specification yields average effects based on between-firm comparisons (specification (1) was based on within-firm comparisons).

We find that our information treatments tend to reduce uncertainty at the time of treatment (Panel A of Table 6). For example, treating firms with information about past inflation lowers the probability assigned to the right tail (defined as inflation above 1.5 times the individual point forecast) by 1.6 percentage points (column 3) and the probability assigned to the left tail (defined as inflation below 0.5 times the individual point forecast) by 1.4 percentage points (column 4). Given that the average probabilities assigned to upper and lower tails are 34.0 (s.d. 19.7) and 16.6 (s.d. 17.3) percent, these changes are modest but tangible. The effects are harder to discern six months after the treatment (Panel B of 6) but this lack of precision in the estimates can be due to a much smaller sample size.

C. Plans

The next key question is how inflation expectations translate into actions. To this end, we exploit post-treatment variation in posterior beliefs to measure the causal effect of inflation expectations on the plans that firms have for their wage and price setting, employment, and costs over the next twelve months.

To get a sense of the data, it is instructive to examine reduced-form evidence. Table 7 presents moments of firms' plan by treatment groups. Firms in the control group plan to increase their prices by 5.2 percent on average but there is wide variation in planned price changes (the standard deviation is 6.6 percent). Few firms plan to cut prices and only 8 percent of firms plan to keep prices at the current levels. Relative to the control group, both treatment groups have smaller and less dispersed planned price increases as well as a higher prevalence of sticky prices. Planned changes in costs and wages have similar moments thus suggesting considerable co-movement in prices, wages, and costs. In contrast, planned employment growth is more similar across the treatment and control groups with large shares of firms planning no changes in employment.

In the next step, we plot (Figure 9) fitted local polynomial regressions of firms' plans on their prior inflation expectations. We observe for the control group that higher inflation expectations are associated with larger price, wage, and cost increases. The relationship between inflation expectations and employment growth is less clear (Panel D): lower levels of expectation are modestly positively correlated with planned employment growth, but the correlation turns negative when inflation expectations exceed approximately 10%. Relative to

this benchmark, we see that planned prices, wage and cost increases are generally moderated for treated firms. This moderation applies for all levels of prior inflation expectations but the difference from the control group is particularly large for high initial inflation expectations (i.e., 10% and above). The pattern for employment is more nuanced: although planned employment growth is only a tad higher for treated firms when inflation expectations are moderate, the difference grows considerably for high inflation expectations. There is however considerable imprecision in the estimates when we approach the high end of inflation expectations as the sample size shrinks.

To make further progress in assessing treatment effects, we build on Coibion et al. (2022, 2023) and the subsequent literature and estimate the following specification:

$$Outcome_i = \gamma_0 + \gamma_1 \times E_{i,t}^{post}\pi_{t+h} + \gamma_2 \times E_{i,t}^{prior}\pi_{t+h} + controls + error_i \qquad (3)$$

where $Outcome$ is a variable of interest, $E_{i,t}^{post}\pi_{t+h}$ is instrumented using RCT variation, with the first-stage regression given by equation (1). γ_1 is the coefficient of interest that has a causal interpretation. The list of controls includes firm and manager characteristics (turnover, employment, firm age, gender and job title of the respondent, 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 method and the second stage uses jackknife to identify influential observations. Note that we do not have instruments to identify separate variation in short- and long-term inflation forecasts and thus we cannot establish whether treatment effects operate via short- or long-term inflation expectations. As a result, we focus on the short-term inflation expectations that have the strongest first stage results but estimates are similar when we use long-term inflation expectations in specification (1).

We find (Panel A, Table 8) that exogenously raising 1-year-ahead inflation expectations by one percentage point increases firms' (planned) prices by approximately 0.3 percentage point. 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, which suggests declining profit margins. We find that higher inflation expectations result in plans to hire more workers: one percentage point higher inflation expectations lead to 0.3 percentage point planned increase in employment. 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 is potentially state-dependent and that the current view is consistent with a demand-driven boom in the economy.

Finally, we find that the (planned) changes are weaker for wages than for prices, while the estimate for wages gets more precise when we control for firm and manager characteristics (compare Panels A and B). 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). Buchheim et al. (2023) offer a potential explanation: as wage contracts tend to have long durations in European countries, few changes in wage contracts happen while contracts are in force but there is more flexibility at the time when a new contract is signed. At this moment, the pass-through from inflation expectations to wage growth is the highest. Because high inflation in the euro area spurred wage contract (re-)negotiations, one may thus expect a higher pass-through to wages.

To understand the sources of these causal effects, we explore two extensions. First, we consider the effects on planned changes by the type of treatment. We find that using variation due to treatment with past inflation (Panel C) does not have statistically significant effects of inflation expectations on firms' plans. In contrast, the causal effects are strong and precisely estimated when we use variation due to treatments with an inflation forecast (Panel D). These results suggest that such treatments may move not only inflation forecasts by firms, as documented above, but may also move the profile of inflation forecasts or the outlook for other variables, thus creating differential effects. From the policy communication perspective, these results suggest that communicating inflation forecasts can generate not only stronger responses of beliefs but also potentially actions.

Second, we conduct a subsample analysis to investigate which types of firms can be most responsive to exogenous changes in inflation expectations. Table 9 reports results for sample splits by various financial indicators. This is an important dimension because financially stressed firms may be more likely to pass shocks on to consumers (e.g., Gilchrist et al. 2017). Consistent with this view, we find that firms with increasing financial needs or financing gaps tend to have stronger responses of their plans to inflation expectations. For example, the response of planned price changes is 0.73 for firms with increased financing gaps and effectively zero for firms that have decreased or unchanged gaps. We report additional sample splits in Appendix Table 8 and find some variation along other dimensions. For

example, firms in high-inflation countries have stronger responses of their plans to inflation expectations than firms in low-inflation countries. This pattern points to potential state-dependence in responses. Obviously, these interpretations of subsample results are tentative as sample splits along any given dimension may be correlated with other dimensions.

D. Follow-up

While inflation expectations cause changes in firms' plans, do the expectations affect firms' subsequent actions? The panel structure of the SAFE allows us to track firms over time but the attrition rate is fairly high. For example, a follow-up wave three months after treatments has only about a quarter of firms that participated in the experiment, which is not unusual for multi-country surveys of firms that are not mandated by the authorities.[17] The overlap between the June and December waves is even smaller. We do not see any evidence that treatment status predicts attrition, but the resulting overlap between waves leaves us with too few observations to have enough statistical power to obtain precise estimates.

Given this constraint, we adopt a different tack. Specifically, Coibion et al. (2020), Boneva et al. (2020) and Kumar et al. (2023) document that, in line with Burstein's (2006) sticky-plan model, firms' plans for pricing and other choices are strong predictors of their actions in Italy, UK, and New Zealand. If the same pattern applies to SAFE firms, one may have more confidence that information treatments influence not only plans but also actions. Figure 10 presents binscatter plots for 12-month-ahead plans in June 2023 vs. 12-month-ahead plans in September 2023 (Panel A) and the 12-month-ahead plans in June 2023 vs. actual 6-month changes in December 2023 (Panel B). We observe a clear relationship between plans over time: a 10 percentage points planned increase in any of the margins (price, costs, wages or employment) in the next 12 months is followed by an approximately 3 to 4 percentage points increase in the plans three months later. In a similar spirit, although there is some discrepancy between horizons for plans and actions, a planned 10 percentage points increase in prices over the next 12 months in June 2023 is followed by an approximately 3 percentage point actual increase between June and December 2023. The binscatters indicate that these relationships are approximately linear and do not depend on a particular part in the distribution of plans. We also verify that the relationships are stable across treatment groups (Appendix Figure 4). These

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[17] For example, two surveys are similar in spirit: the European Investment Bank's Investment Survey (EIBIS) and the EBRD-EIB-WB Enterprise survey (previously known as BEEPS). Similar to SAFE, both surveys cover multiple countries and participation is not mandatory. These surveys also have a panel component with roughly 20-30 percent of firms participating in consecutive waves (see EBRD 2020 and Ipsos Mori 2020).

findings suggest a large, consistent, and persistent pass-through from plans to actions. Hence, one may expect that inflation expectations indeed affect prices, costs, wages, and employment.

5. Conclusion

Central banks emphasise the importance of anchored inflation expectations for macroeconomic stabilization. And yet, inflation expectations (especially for firms) are poorly understood because consistent cross-country measurement of expectations as well as exogenous variation in expectations are lacking. In response to these challenges, our novel euro area survey of firms' inflation expectations provides a critical input for positive and normative macroeconomic analyses.

The survey has many desirable features and thus should become a rich source of information for researchers and policymakers. For instance, we document that the high-inflation environment in 2023 was reflected in elevated short-term inflation expectations by firms. On the other hand, the survey gives reasons for optimism. First, firms expect inflation to fall over time. Second, firms expect convergence of inflation rates across countries. Third, firms respond strongly to information treatments with past inflation and inflation forecasts, thus giving the ECB ammunition to affect inflation via policy communication.

The survey opens many avenues for future research. In addition to having a broad cross-country coverage, they survey can be linked to other datasets (especially capturing financial variables) and thus enable us to shed light on questions that other surveys could not answer. As the survey accumulates more observations over time, one can exploit variation in macroeconomic conditions to understand how firms form expectations and act on those expectations. One can also experiment with various forms of policy communication to establish what messages or which media channels are most effective in shaping firms' beliefs. In short, this survey offers an important infrastructure for central banks and macroeconomists.

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Table 1. Descriptive statistics for firms' euro area inflation expectations (point predictions)

		Actual inflation	1 year ahead			3years ahead[*]			5 years ahead		
			Mean	median	std	mean	median	std	mean	median	std
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Euro area	Jun-23	5.5	5.83	5.00	2.95	5.00	3.50	4.27	4.83	3.00	4.99
	Dec-23	2.9	5.04	4.00	3.60	5.36	3.00	5.13	5.91	3.00	6.44
Austria	Jun-23	7.8	6.94	6.50	3.03	5.00	4.00	4.30	4.52	3.00	4.76
	Dec-23	5.7	5.62	5.00	2.63	6.12	4.00	4.93	6.51	3.00	6.81
Belgium	Jun-23	1.6	5.16	5.00	3.25	5.40	3.20	5.00	6.11	3.00	5.94
	Dec-23	0.5	4.62	4.00	3.51	6.34	4.00	5.55	7.88	5.00	7.19
Germany	Jun-23	6.8	6.11	5.70	2.45	5.17	4.00	3.95	4.91	3.00	4.84
	Dec-23	3.8	4.98	4.00	3.47	5.41	4.00	5.06	6.27	3.30	6.85
Spain	Jun-23	1.6	4.88	4.00	3.26	3.95	3.00	3.73	3.56	2.20	3.62
	Dec-23	3.3	4.46	3.80	3.57	4.32	3.00	4.53	4.22	3.00	4.50
Finland	Jun-23	4.1	4.98	5.00	2.34	3.81	3.00	3.13	3.59	2.30	3.88
	Dec-23	1.3	3.80	3.50	2.14	3.23	2.30	2.85	3.53	2.50	3.68
France	Jun-23	5.3	5.31	5.00	3.02	5.22	3.00	4.36	5.46	3.00	5.67
	Dec-23	4.1	5.05	4.00	3.46	5.33	3.00	4.86	5.88	3.00	5.96
Greece	Jun-23	2.8	6.45	5.00	3.89	5.35	4.00	5.11	4.77	3.00	4.47
	Dec-23	3.7	5.98	5.00	4.84	4.63	3.00	4.85	4.56	2.50	5.55
Ireland	Jun-23	4.8	5.38	5.00	2.61	4.57	4.00	3.45	4.44	3.00	4.26
	Dec-23	3.2	5.02	5.00	3.70	6.07	3.00	5.58	6.47	3.00	7.32
Italy	Jun-23	6.7	6.45	6.00	3.45	5.14	4.00	4.87	4.72	3.00	4.90
	Dec-23	0.5	5.59	5.00	4.54	4.77	3.00	5.02	4.65	2.50	5.57
Netherlands	Jun-23	6.4	5.74	5.00	2.27	5.76	4.00	5.04	6.16	3.00	6.34
	Dec-23	1.0	5.59	5.00	3.21	7.99	6.00	6.18	9.59	7.00	7.73
Portugal	Jun-23	4.7	5.13	5.00	2.33	3.35	3.00	2.55	2.98	2.00	3.08
	Dec-23	1.9	4.39	3.50	3.68	3.44	2.00	4.00	3.26	2.00	4.34
Slovakia	Jun-23	11.3	8.55	9.00	4.11	7.15	5.00	5.67	6.18	4.00	6.25
	Dec-23	6.6	6.86	6.00	3.34	7.26	5.00	7.19	7.50	4.00	8.47
Memorandum for euro area											
Households (CES)	Jun-23		5.53	4.30	5.85	4.38	3.00	5.57			
	Dec-23		5.26	3.50	5.53	4.30	2.50	5.44			
Professional forecasters (SPF)	Q2-23		2.81	2.75	1.06	2.23	2.20	1.08	2.13	2.00	0.36
	Q4-23		2.48	2.80	0.51	2.05	2.15	0.37	2.14	2.00	0.32

Notes: Statistics in columns (2)-(10) are based on pre-treatment responses for June 2023 and control group responses for December 2023. Statistics for SAFE and CES are trimmed at -1% and 30%. ():For the SPF, the medium-term horizon refers to 2 years ahead.

Table 2. Uncertainty in 5-year-ahead inflation forecasts

Countries		Actual inflation	CV		St.dev.		Lower tail		Upper tail	
			mean	std	mean	std	mean	std	mean	std
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. Euro area inflation										
Euro area	Jun-23	5.5	0.34	0.10	1.65	1.83	16.6	17.3	34.0	19.7
	Dec-23	2.9	0.35	0.11	2.06	2.44	17.6	19.5	35.6	22.0
Austria	Jun-23	7.8	0.34	0.12	1.65	2.01	13.5	15.3	36.5	22.6
	Dec-23	5.7	0.35	0.10	2.34	2.56	16.1	18.9	37.5	20.4
Belgium	Jun-23	1.6	0.28	0.12	1.76	1.82	10.5	12.8	24.7	20.0
	Dec-23	0.5	0.35	0.12	2.94	2.72	21.9	23.1	33.5	24.1
Germany	Jun-23	6.8	0.35	0.10	1.84	1.91	16.0	16.3	36.8	19.9
	Dec-23	3.8	0.34	0.10	2.14	2.60	16.2	18.5	34.7	20.8
Spain	Jun-23	1.6	0.32	0.12	1.15	1.21	17.4	19.1	30.6	19.7
	Dec-23	3.3	0.34	0.11	1.45	1.71	17.5	18.5	35.2	23.3
Finland	Jun-23	4.1	0.39	0.12	1.26	2.03	31.8	20.6	35.0	16.8
	Dec-23	1.3	0.37	0.11	1.23	1.27	22.2	19.0	36.4	18.7
France	Jun-23	5.3	0.34	0.09	1.92	1.98	15.8	16.7	34.2	18.3
	Dec-23	4.1	0.35	0.11	2.04	2.31	19.2	20.2	38.7	23.9
Greece	Jun-23	2.8	0.33	0.14	1.30	1.31	24.9	24.2	26.8	21.6
	Dec-23	3.7	0.42	0.09	1.68	1.96	39.7	28.4	29.1	20.8
Ireland	Jun-23	4.8	0.33	0.09	1.31	0.94	10.2	10.4	36.1	22.6
	Dec-23	3.2	0.38	0.10	2.42	2.96	19.0	19.6	38.7	21.2
Italy	Jun-23	6.7	0.35	0.11	1.43	1.90	21.0	18.3	35.6	18.9
	Dec-23	0.5	0.36	0.10	1.72	2.06	18.0	17.0	37.8	21.0
Netherlands	Jun-23	6.4	0.31	0.10	1.99	2.17	13.0	14.9	28.7	16.0
	Dec-23	1.0	0.32	0.11	3.23	3.00	15.9	22.0	30.4	20.6
Portugal	Jun-23	4.7	0.32	0.12	0.87	0.57	17.4	16.9	30.6	20.6
	Dec-23	1.9	0.32	0.12	0.92	1.11	14.9	20.9	34.8	24.7
Slovakia	Jun-23	11.3	0.33	0.11	2.13	2.61	14.5	16.7	33.6	22.1
	Dec-23	6.6	0.37	0.11	2.75	3.48	20.0	20.4	39.2	21.6
Panel B. National inflation										
Euro area average	Jun-23	5.5	0.34	0.12	1.74	2.02	16.5	18.4	34.8	21.2
Austria	Jun-23	7.8	0.32	0.10	1.42	1.72	13.2	12.1	30.4	17.8
Belgium	Jun-23	1.6	0.30	0.12	1.34	1.97	9.8	12.9	30.8	21.2
Germany	Jun-23	6.8	0.35	0.12	2.02	2.16	16.8	18.7	36.7	20.2
Spain	Jun-23	1.6	0.34	0.11	1.27	1.97	18.5	19.1	33.8	19.9
Finland	Jun-23	4.1	0.39	0.07	1.07	0.91	23.5	18.2	37.3	13.8
France	Jun-23	5.3	0.36	0.10	2.11	2.16	15.3	15.0	39.7	22.0
Greece	Jun-23	2.8	0.36	0.13	1.36	1.51	20.5	23.1	39.5	28.7
Ireland	Jun-23	4.8	0.31	0.12	1.64	1.47	13.5	13.6	30.5	18.8
Italy	Jun-23	6.7	0.33	0.13	1.38	1.56	16.6	21.9	30.5	24.7
Netherlands	Jun-23	6.4	0.31	0.11	1.70	2.06	15.9	19.3	28.1	19.3
Portugal	Jun-23	4.7	0.35	0.12	1.01	1.28	20.5	19.4	34.7	18.7
Slovakia	Jun-23	11.3	0.29	0.15	1.95	2.86	13.0	16.1	30.8	19.9

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 at the time of the survey. Columns (2) and (3) report statistics for the coefficient of variation. Columns (4) and (5) report statistics for the standard deviation implied by the reported subjective probability distributions. Columns (6) and (7) report results for the probability assigned to the scenario where inflation is below 0.5*(point prediction). Columns (8) and (9) 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. This table covers only firms in the control group. Panel B shows results for national inflation expectations.

Table 3. Descriptive statistics for firms' national inflation expectations (point predictions)

		Actual inflation	1 year ahead prediction			3 year ahead prediction			5 year ahead prediction		
			mean	median	std	mean	median	std	mean	median	std
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Euro area average	Jun-23	5.5	5.84	5.00	2.73	5.12	4.00	4.22	5.07	3.00	5.35
	Dec-23	2.9	5.03	4.50	3.40	4.92	3.00	4.66	5.25	3.00	5.77
Austria	Jun-23	7.8	6.70	6.00	2.80	5.53	4.00	4.90	4.57	3.00	4.92
	Dec-23	5.7	5.71	5.00	2.60	4.24	3.00	3.46	4.54	3.00	5.08
Belgium	Jun-23	1.6	4.58	4.00	1.94	4.32	3.00	3.89	4.52	2.50	5.51
	Dec-23	0.5	5.24	4.00	5.32	6.55	4.00	6.37	7.12	4.50	7.40
Germany	Jun-23	6.8	6.18	6.00	2.04	5.55	4.00	3.84	5.67	4.00	5.22
	Dec-23	3.8	5.27	5.00	2.80	5.96	4.00	4.79	6.37	4.00	6.02
Spain	Jun-23	1.6	4.71	4.00	2.60	3.71	3.00	3.57	3.82	2.00	5.36
	Dec-23	3.3	5.16	4.00	3.26	5.78	3.00	6.04	6.35	3.00	7.16
Finland	Jun-23	4.1	4.61	4.60	1.96	3.31	3.00	2.46	3.45	2.30	3.33
	Dec-23	1.3	3.81	3.40	1.52	3.23	2.50	2.87	3.49	2.00	4.84
France	Jun-23	5.3	5.85	5.00	3.14	5.75	4.00	4.91	5.76	3.00	6.11
	Dec-23	4.1	5.31	5.00	4.87	4.87	3.00	5.18	5.02	2.00	5.74
Greece	Jun-23	2.8	6.26	5.50	3.64	5.06	3.50	5.04	4.32	3.00	5.08
	Dec-23	3.7	5.89	4.50	5.00	4.90	2.50	5.74	4.26	2.00	5.69
Ireland	Jun-23	4.8	6.28	6.00	4.34	5.48	4.00	4.22	5.43	4.00	4.58
	Dec-23	3.2	4.61	5.00	2.22	4.19	3.00	3.71	4.64	4.00	4.21
Italy	Jun-23	6.7	6.08	5.60	2.81	4.62	4.00	3.48	4.04	3.00	3.72
	Dec-23	0.5	4.55	4.00	2.70	3.66	2.30	3.33	3.83	2.00	4.78
Netherlands	Jun-23	6.4	5.50	5.00	2.87	5.40	3.30	4.92	5.62	3.00	6.30
	Dec-23	1.0	4.64	4.50	2.37	5.68	4.00	3.97	6.89	4.00	6.13
Portugal	Jun-23	4.7	4.90	5.00	2.60	3.52	2.50	4.35	2.68	2.00	2.45
	Dec-23	1.9	4.40	3.50	3.41	3.65	2.20	3.87	4.02	2.00	4.12
Slovakia	Jun-23	11.3	9.91	10.00	3.78	8.54	5.00	6.33	8.21	3.30	8.79
	Dec-23	6.6	8.25	7.00	4.67	6.05	3.40	6.21	5.02	3.00	5.53

Table 4. Shapley decomposition of R^2 for predictors of inflation expectations.

Blocks of variables	Point prediction						Uncertainty, CV		Uncertainty, St.dev.	
	1 year ahead		3 years ahead		5 years ahead		5 years ahead		5 years ahead	
	contribution	share	contribution	share	contribution	share	contribution	share	contribution	share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Demographics of managers	0.0117	4.6%	0.0231	11.5%	0.0208	11.0%	0.0082	9.6%	0.0080	5.7%
Demographics of firms	0.0343	13.5%	0.0691	34.5%	0.0749	39.6%	0.0203	23.7%	0.0527	36.9%
Firms' choices and constraints	0.0565	22.2%	0.0502	25.1%	0.0497	26.3%	0.0151	17.6%	0.0534	37.4%
Survey technical variables	0.0030	1.2%	0.0066	3.3%	0.0061	3.2%	0.0060	7.0%	0.0046	3.2%
Sector fixed effects	0.0017	0.7%	0.0046	2.3%	0.0012	0.1%	0.0003	0.3%	0.0003	0.2%
Country fixed effects	0.1474	57.9%	0.0464	23.2%	0.0365	19.3%	0.0358	41.7%	0.0236	16.5%
Total	0.2546	100.0%	0.2000	100.0%	0.1891	100.0%	0.0857	100.0%	0.1426	100.0%

Notes: The table reports Shapley (1953) decomposition of R^2 for block of variables. Demographics of managers includes gender and position. 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. Survey technical variables includes the mode and duration of interview. Columns (1), (3), (5), (7) and (9) report the marginal R^2 for a given block of variables. Columns (2), (4), (6), (8) and (10) report the share in total R^2 reported in the bottom row.

Table 5. Treatment effects on beliefs

Dep. Var.: *Posterior*	Huber			OLS		
	1 year ahead	3 year ahead	5 year ahead	1 year ahead	3 year ahead	5 year ahead
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Posteriors immediately after the treatment						
$\mathbb{I}(Treatment = Actual\ \pi)$	1.31***	2.10***	1.28***	3.14***	2.08***	1.28***
	(0.09)	(0.23)	(0.21)	(0.32)	(0.23)	(0.21)
$\mathbb{I}(Treatment = Forecast\ \pi)$	1.71***	0.85***	0.94***	2.45***	1.51***	0.94***
	(0.09)	(0.05)	(0.30)	(0.31)	(0.28)	(0.30)
Prior	1.00	1.00	1.00	1.00	1.00	1.00
$Prior \times \mathbb{I}(Treatment = Actual\ \pi)$	-0.21***	-0.39***	-0.28***	-0.49***	-0.38***	-0.28***
	(0.02)	(0.05)	(0.06)	(0.05)	(0.05)	(0.06)
$Prior \times \mathbb{I}(Treatment = Forecast\ \pi)$	-0.53***	-0.30***	-0.33***	-0.63***	-0.45***	-0.33***
	(0.02)	(0.01)	(0.08)	(0.06)	(0.07)	(0.08)
Observations	2,828	2,664	2,584	2,917	2,723	2,584
R-squared	0.92	0.79	0.82	0.70	0.74	0.82
Panel B. Posteriors 6 months after the treatment						
$\mathbb{I}(Treatment = Actual\ \pi)$	-0.55	-1.81*	-3.35**	1.54	-0.70	-0.68
	(0.92)	(1.00)	(1.65)	(1.71)	(1.50)	(2.49)
$\mathbb{I}(Treatment = Forecast\ \pi)$	2.27**	-0.64	-2.25	3.35***	0.82	-0.49
	(0.98)	(0.99)	(1.39)	(1.27)	(1.46)	(2.25)
Prior	0.46***	0.42***	0.27*	0.45***	0.45***	0.33**
	(0.13)	(0.12)	(0.16)	(0.14)	(0.14)	(0.16)
$Prior \times \mathbb{I}(Treatment = Actual\ \pi)$	0.04	0.04	0.24	-0.22	0.11	0.07
	(0.16)	(0.13)	(0.15)	(0.27)	(0.22)	(0.21)
$Prior \times \mathbb{I}(Treatment = Forecast\ \pi)$	-0.32**	-0.27*	-0.20	-0.28	-0.17	0.19
	(0.16)	(0.14)	(0.13)	(0.24)	(0.19)	(0.30)
Observations	264	226	194	270	236	205
R-squared	0.25	0.27	0.27	0.11	0.20	0.19

Notes: The table reports estimates of specification (1) by forecast horizon. Columns (1)-(3) report Huber robust estimates. Columns (4)-(6) report OLS estimates. By construction of posterior for the control group, the coefficient on the prior for the control group is equal to 1. Country fixed effects are included but not reported. Robust standard errors are reported in parentheses. ***,**,* denote statistical significance at 1, 5 and 10 percent levels.

Table 6. Treatment effects on uncertainty.

Dep. Var.: *Posterior*	Huber				OLS			
	CV	St.Dev.	Upper tail	Lower tail	CV	St.Dev.	Upper tail	Lower tail
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Posteriors immediately after the treatment								
$\mathbb{I}(Treatment = Actual\ \pi)$	-0.007	0.067**	-1.644*	-1.369**	-0.004	-0.145	-0.346	0.085
	(0.005)	(0.031)	(0.938)	(0.583)	(0.009)	(0.124)	(1.683)	(1.455)
$\mathbb{I}(Treatment = Forecast\ \pi)$	-0.009*	-0.073***	-2.303**	-0.707	-0.015*	-0.274*	-1.951	-0.011
	(0.005)	(0.028)	(0.952)	(0.596)	(0.009)	(0.152)	(1.657)	(1.228)
Observations	2,378	2,268	2,468	2,399	2,402	2,443	2,482	2,482
R-squared	0.031	0.032	0.014	0.059	0.017	0.020	0.013	0.016
Panel B. Posteriors 6 months after the treatment								
$\mathbb{I}(Treatment = Actual\ \pi)$	0.032	0.055	2.153	-4.237**	0.054	0.229	2.063	5.863
	(0.020)	(0.179)	(3.079)	(1.826)	(0.038)	(0.425)	(5.588)	(4.650)
$\mathbb{I}(Treatment = Forecast\ \pi)$	0.033*	0.119	4.984	6.472**	0.081*	2.411*	4.289	11.397*
	(0.019)	(0.219)	(3.143)	(2.905)	(0.042)	(1.409)	(6.105)	(6.145)
Observations	217	213	235	217	222	227	239	239
R-squared	0.165	0.108	0.133	0.208	0.133	0.167	0.074	0.112

Notes: The table reports estimates of specification (2) by forecast horizon. Columns (1)-(4) report Huber robust estimates. Columns (5)-(8) report OLS estimates. Country fixed effects are included but not reported. Robust standard errors are reported in parentheses. ***,**,* denote statistical significance at 1, 5 and 10 percent levels.

Table 7. Planned decisions of firms by treatment arm

	mean	St.dev.	Share of zeros	P25	P50	P75
	(1)	(2)	(4)	(5)	(6)	(7)
Panel A. Planned price changes						
Control	5.21	6.59	0.08	2.00	5.00	8.00
Treat with π	4.56	6.22	0.09	1.10	5.00	7.00
Treat with $E\pi$	4.32	5.92	0.11	1.50	4.00	5.50
Panel B. Planned cost changes						
Control	5.64	7.34	0.08	2.00	5.00	9.00
Treat with π	4.34	6.21	0.08	1.50	4.00	7.00
Treat with $E\pi$	4.70	6.45	0.08	2.00	4.00	6.00
Panel C. Planned wage changes						
Control	5.08	3.99	0.09	3.00	4.50	6.60
Treat with π	4.54	3.75	0.11	2.00	4.00	5.00
Treat with $E\pi$	4.56	3.65	0.11	2.00	4.00	5.50
Panel D. Planned employment						
Control	2.20	8.09	0.34	0.00	0.00	5.00
Treat with π	2.32	7.91	0.30	0.00	0.00	5.00
Treat with $E\pi$	2.19	7.11	0.34	0.00	0.00	5.00

Notes: The table reports moments for firm's planned decisions by treatment group.

Table 8. Causal effects of inflation expectations on firms' plans

	Change in:			
	Prices	Costs	Wages	Employment
	(1)	(2)	(3)	(4)
Panel A. No controls				
Posterior $E_{i,t}^{post}\pi_{t+h}$	0.39**	0.67***	0.15	0.34*
	(0.17)	(0.17)	(0.09)	(0.20)
Observations	2,680	2,724	2,701	2,608
R-squared	0.06	0.08	0.11	0.02
1st stage F-stat	341.9	336.2	332.8	304.2
Panel B. Controls included				
Posterior $E_{i,t}^{post}\pi_{t+h}$	0.32**	0.62***	0.17*	0.34*
	(0.16)	(0.17)	(0.09)	(0.20)
Observations	2,679	2,726	2,701	2,609
R-squared	0.10	0.11	0.14	0.04
1st stage F-stat	332.7	337.5	336.3	304.5
Panel C. Only past inflation treatment, no controls				
Posterior $E_{i,t}^{post}\pi_{t+h}$	0.30	-0.47	-0.06	-0.25
	(0.67)	(0.70)	(0.38)	(0.82)
Observations	1,817	1,851	1,838	1,772
R-squared	0.05	0.09	0.11	0.01
1st stage F-stat	99.58	97.57	95.32	95.25
Panel D. Only inflation forecast treatment, no controls				
Posterior $E_{i,t}^{post}\pi_{t+h}$	0.47**	0.90***	0.29***	0.30
	(0.18)	(0.18)	(0.10)	(0.22)
Observations	1,829	1,859	1,846	1,776
R-squared	0.07	0.10	0.13	0.02
1st stage F-stat	579.1	569.5	564.1	512.9

Notes: The table reports estimates of coefficient γ_1 in specification (3). The first stage regression is given by specification (1). Influential observations are removed as in Coibion et al. (2022). In Panel B, the following variable are included as controls: firm's age, sector, turnover and employment. Panel C is restricted to the control group and the treatment group where firms are informed about past 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. Robust standard errors are reported in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Table 9. Heterogeneous effects by financing needs and availability

	Prices		Costs		Wages		Employment	
	Coef. (s.e.)	N obs {F-stat}	Coef. (s.e.)	N obs {F-stat}	Coef. (s.e.)	N obs {F-stat}	Coef. (s.e.)	N obs {F-stat}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. By change in financing needs								
Increased	0.99***	2,001	0.82***	2,037	0.41***	2,018	0.24	1,947
	(0.27)	{88.1}	(0.30)	{88.0}	(0.17)	{87.1}	(0.40)	{80.8}
Decreased or unchanged	-0.06		0.53***		0.07		0.38	
	(0.23)		(0.23)		(0.13)		(0.27)	
Difference in estimates	Δ=1.05***		Δ=0.28		Δ=0.34		Δ=-0.14	
Panel B. By change in financing availability								
Decreased	0.74	1,978	1.05*	2,012	0.37	1,994	1.02	1,923
	(0.57)	{0.0}	(0.63)	{0.0}	(0.28)	{0.0}	(0.70)	{0.0}
Increased or unchanged	0.15		0.57***		0.13		0.28	
	(0.19)		(0.19)		(0.11)		(0.25)	
Difference in estimates	Δ=0.59		Δ=0.48		Δ=0.25		Δ=0.74	
Panel C. By change in financing gap								
Increased	0.73***	1,941	0.52*	1,975	0.37**	1,957	-0.08	1,887
	(0.29)	{80.8}	(0.30)	{80.3}	(0.16)	{79.4}	(0.42)	{73.2}
Decreased or unchanged	-0.04		0.68***		0.08		0.57**	
	(0.23)		(0.23)		(0.13)		(0.28)	
Difference in estimates	Δ=0.77**		Δ=-0.16		Δ=0.29		Δ=-0.65	

Notes: See Table 8. 1st stage F-statistic are reported in curly parentheses. Δ shows the difference in estimated coefficients across groups. For each of bank loans, trade credit and credit lines, needs and availability can increase (1), stay unchanged (0) or decrease (-1). For each of these financing instruments, the change in the financing gap is defined as 1 if needs increase and availability decreases; 0 if both are unchanged; -1 if needs decrease and availability increase; and 0.5 or -0.5 if only one of the components changes. The composite change in financing needs, availability and gap is computed as the average of the variable across bank loans, trade credit and credit lines.

Figure 1. Structure of the survey
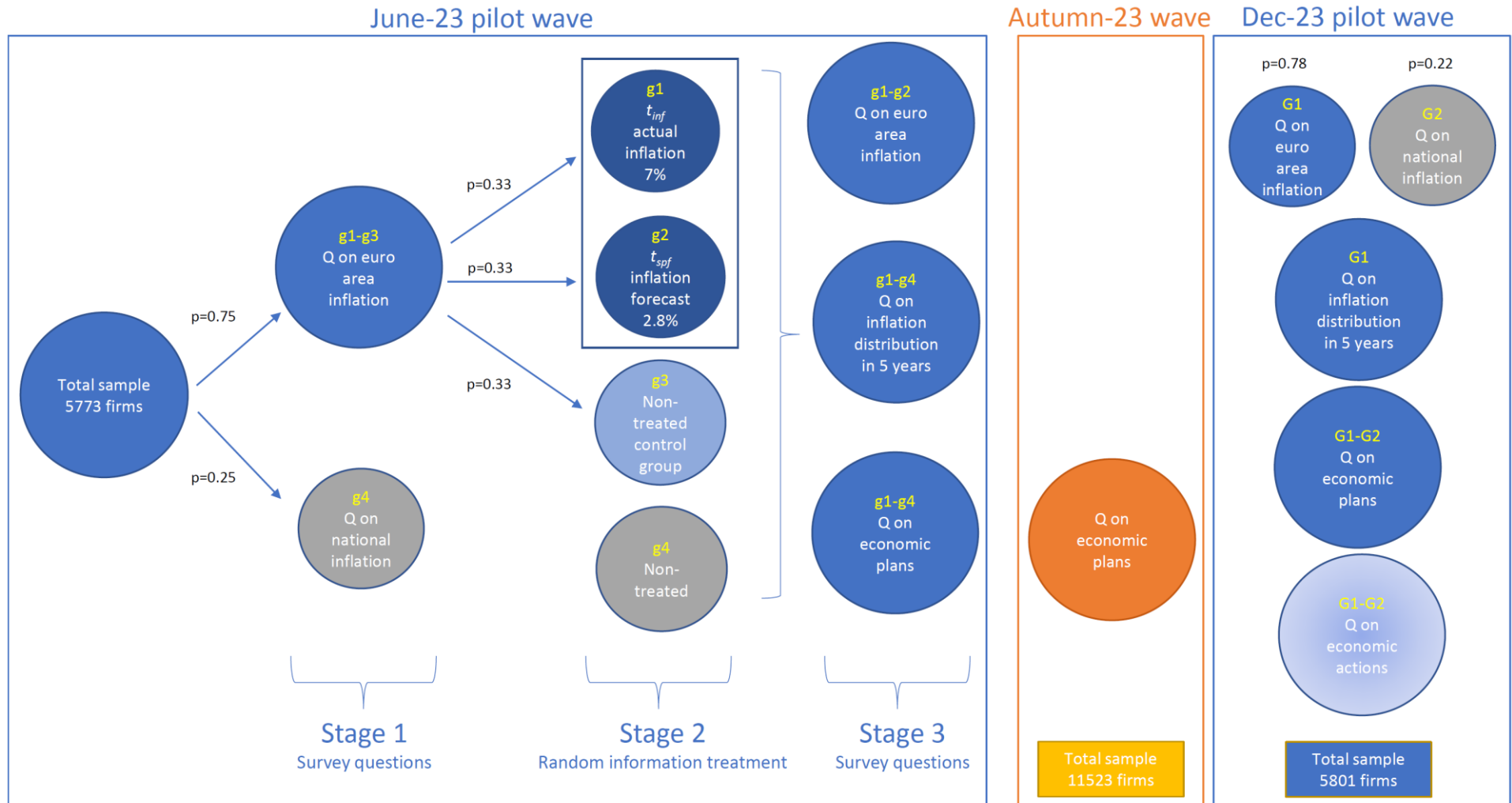
Figure 2. Histogram of inflation expectations (point predictions)
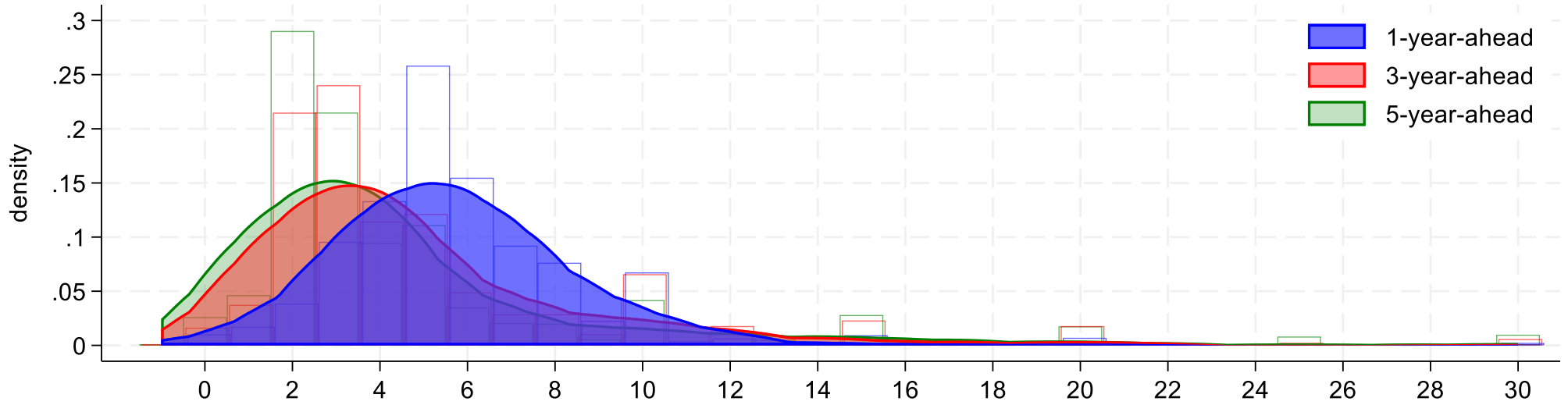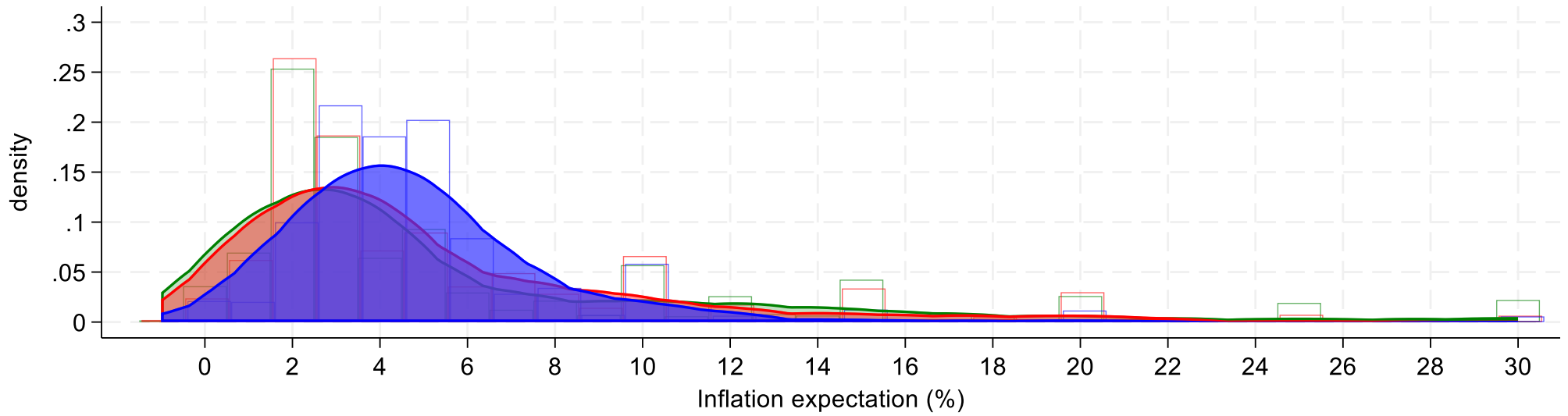
Figure 3. Joint distribution of short-term and longer-term inflation forecasts
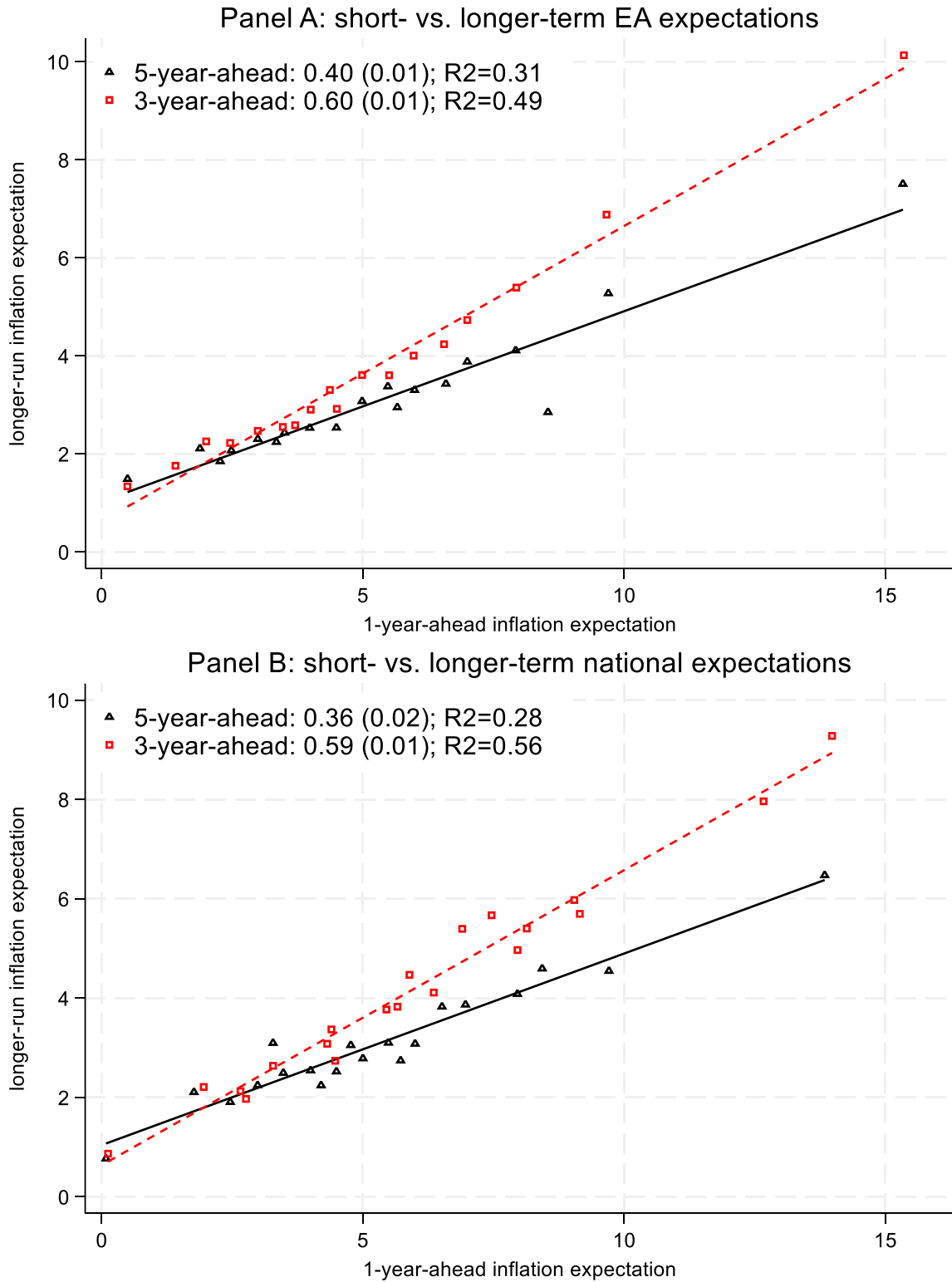
Notes: Each panel is a binscatter plot. R^2 and estimated slopes (standard errors are in parentheses) for fitted regressions are reported. EA stands for euro area. Huber weights are applied to minimise the influence of outliers.

Figure 4. Moments of uncertainty for inflation forecasts (5-year-ahead)
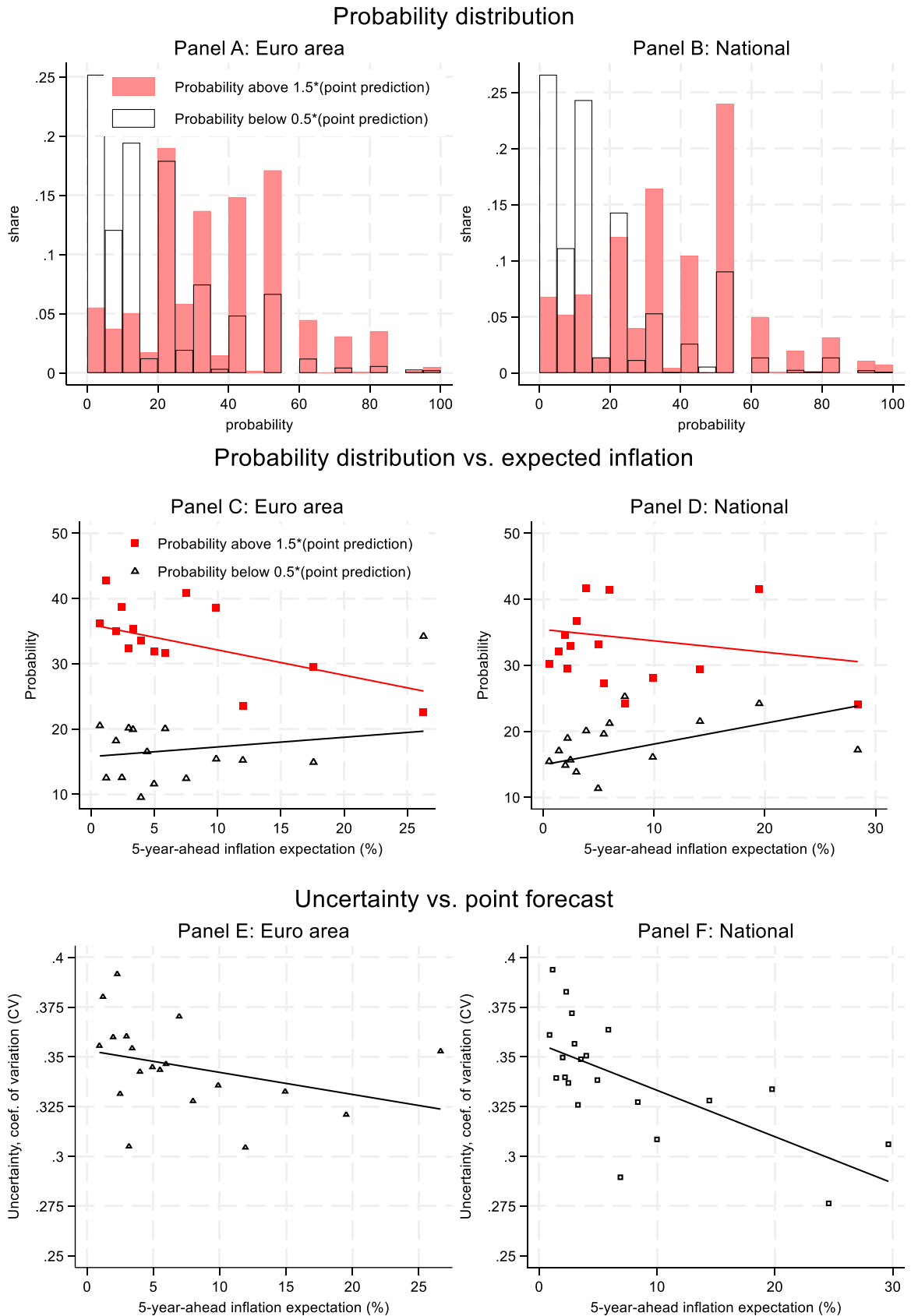
Notes: Panels A and B show the distribution of probabilities assigned to lower and upper tails of reported subjective probability distributions for inflation expectations. Panels C and D are binscatter plots showing the joint distribution of inflation expectations and probabilities assigned to the tails. All moments are for inflation expectations at 5-year-ahead horizon.

Figure 5. One year ahead inflation expectations, euro area vs national
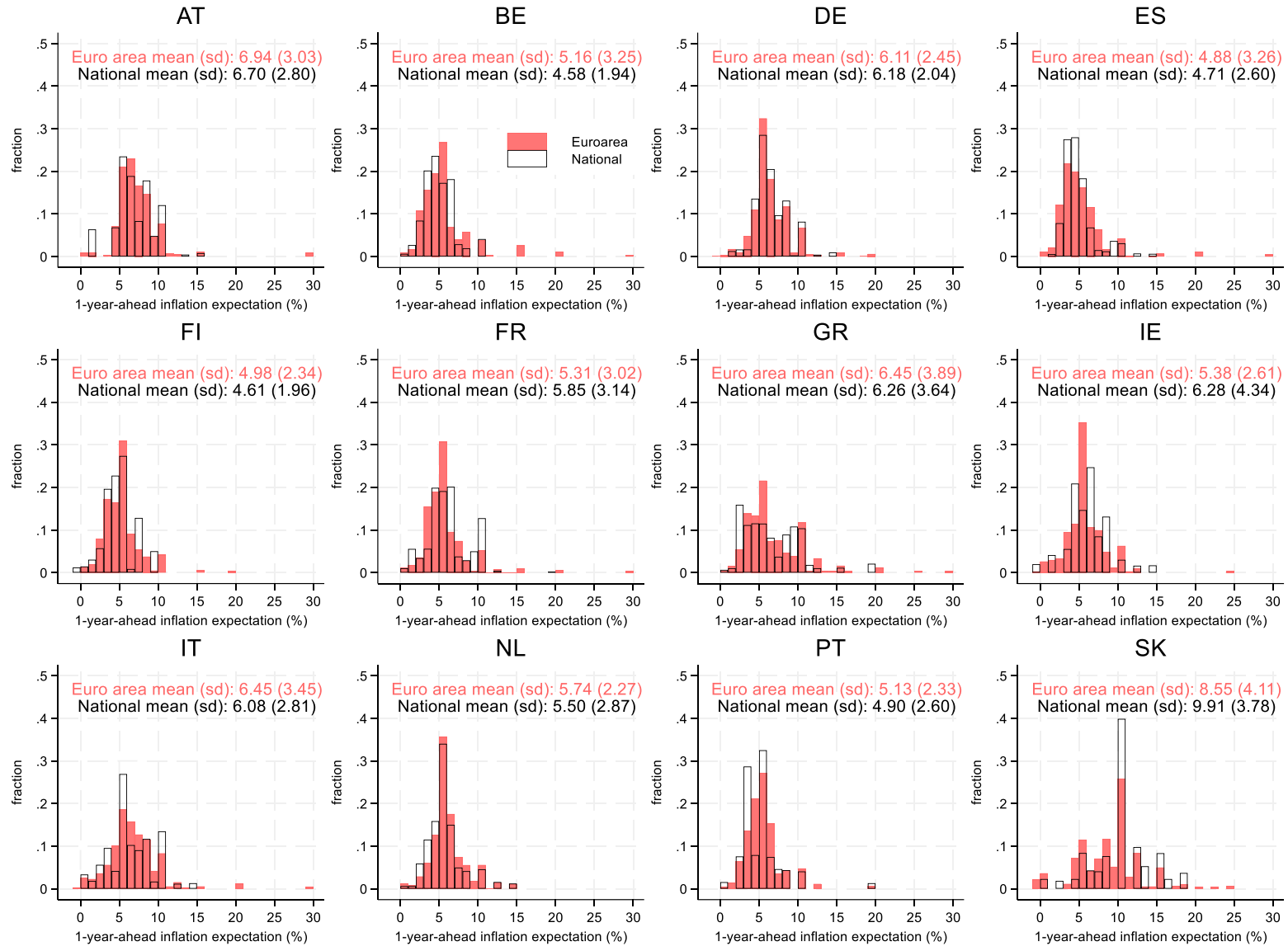
Notes: the distributions are trimmed at -1 and 30 percent.

Figure 6. Binscatter plot of firm characteristics and 1-year-ahead inflation expectations and against inflation uncertainty
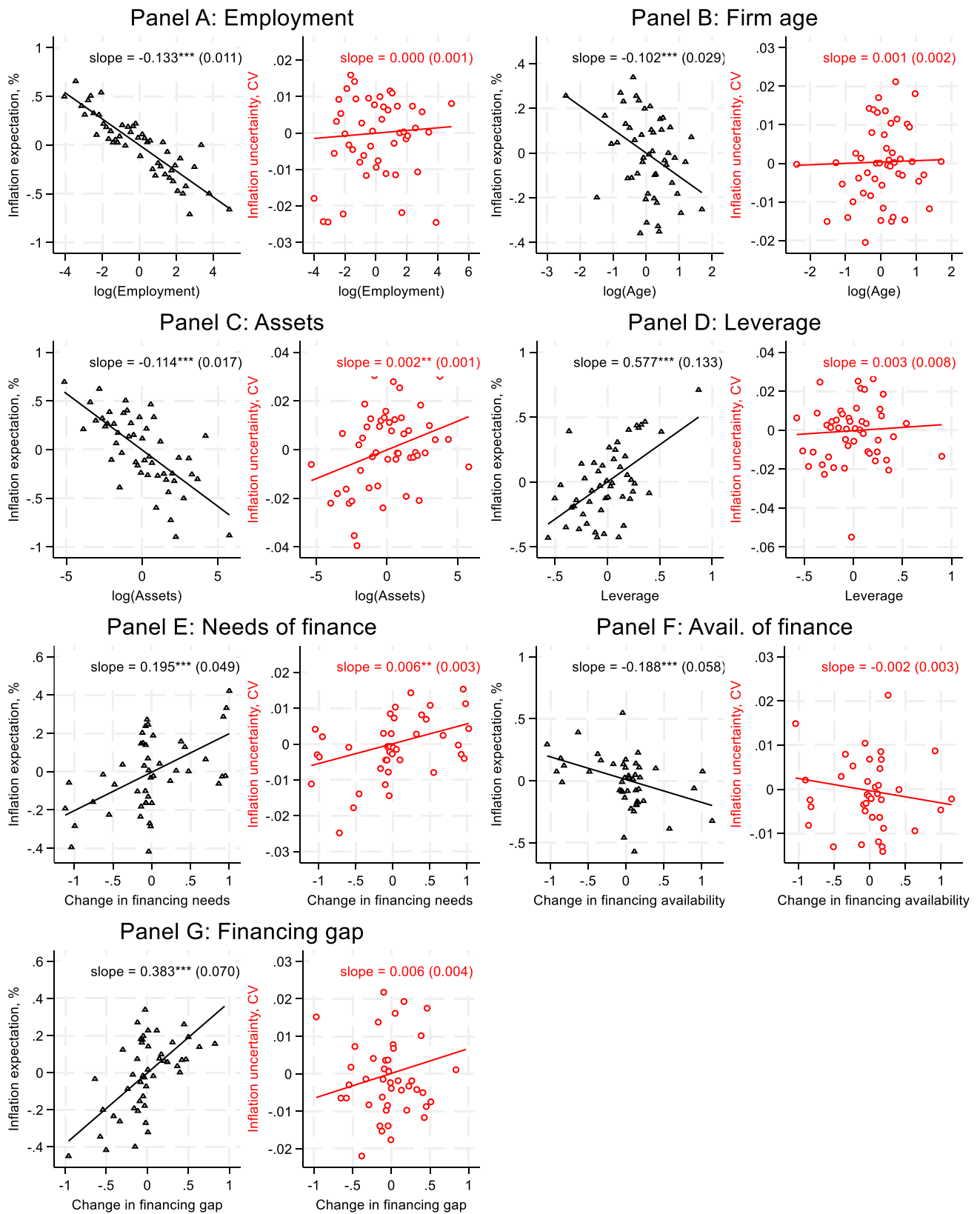
Notes: The figure shows binned scatter plots of various firm characteristics against firms' 1-year-ahead inflation expectations and against inflation uncertainty measured by coefficient of variation, with Huber weights and conditional on country, sector and time fixed effects.

Figure 7. Forecast revisions in response to information treatments
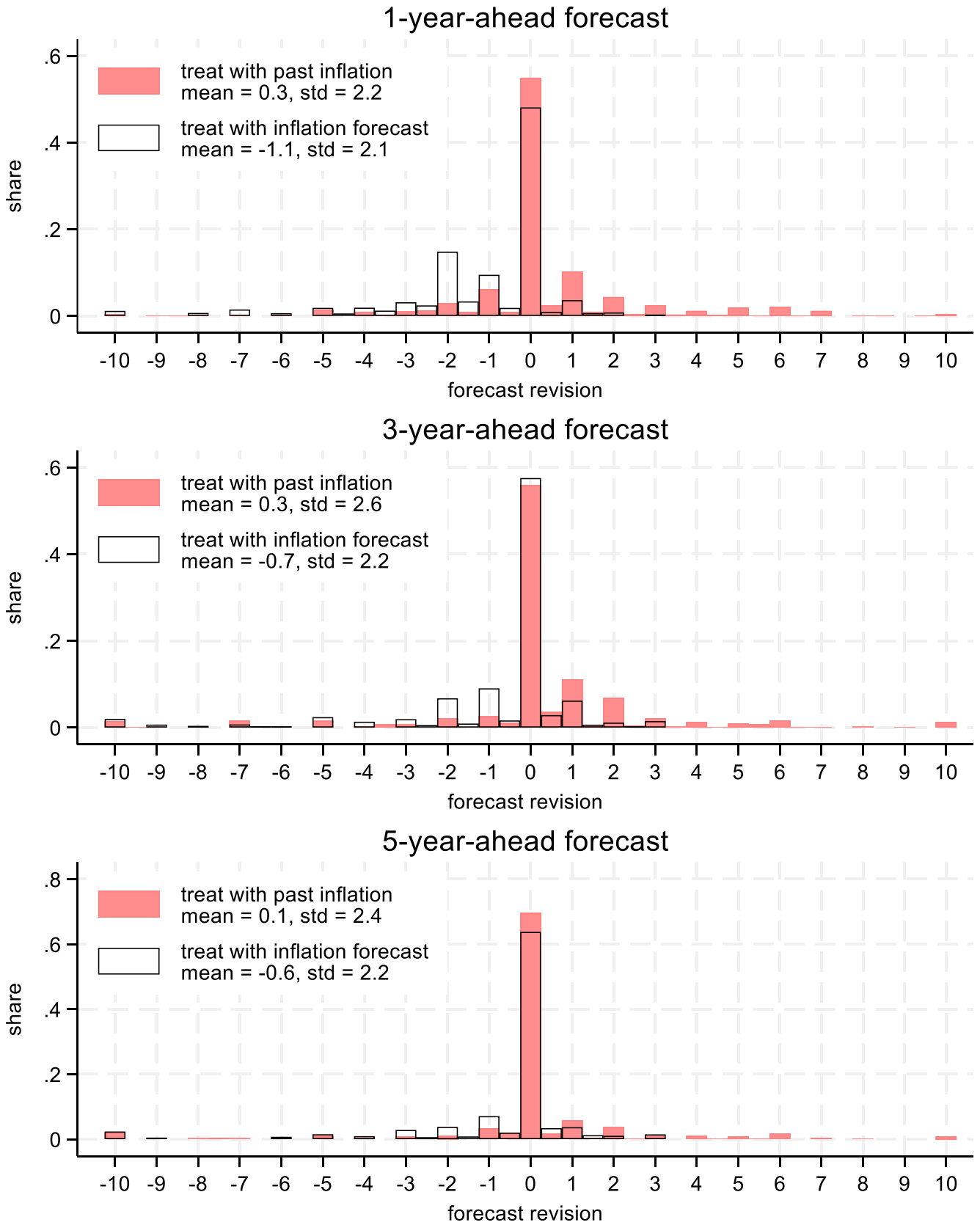
Notes: Each panel plots histograms for forecast revisions by treatment group. The legend of each panel reports the mean size and standard deviation of revisions. Revisions are trimmed at +10% and -10

Figure 8. Binscatter of posterior vs. prior inflation expectations by treatment group and forecast horizon (Huber)
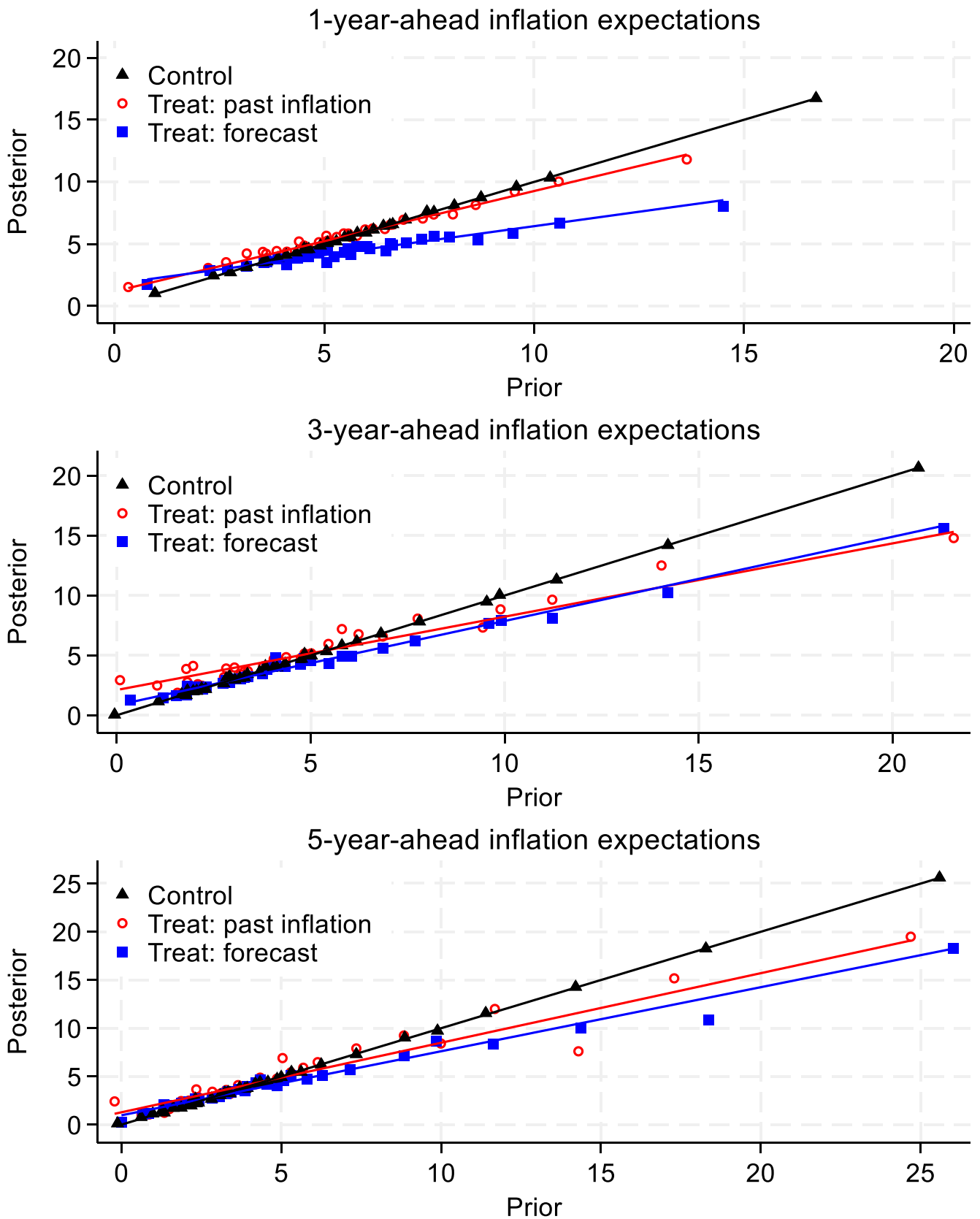
Notes: Each panel is a binscatter plot of prior vs posterior beliefs. Huber weights are applied to minimise the influence of outliers.

Figure 9. Reduced-form effects of treatments on firms' plans
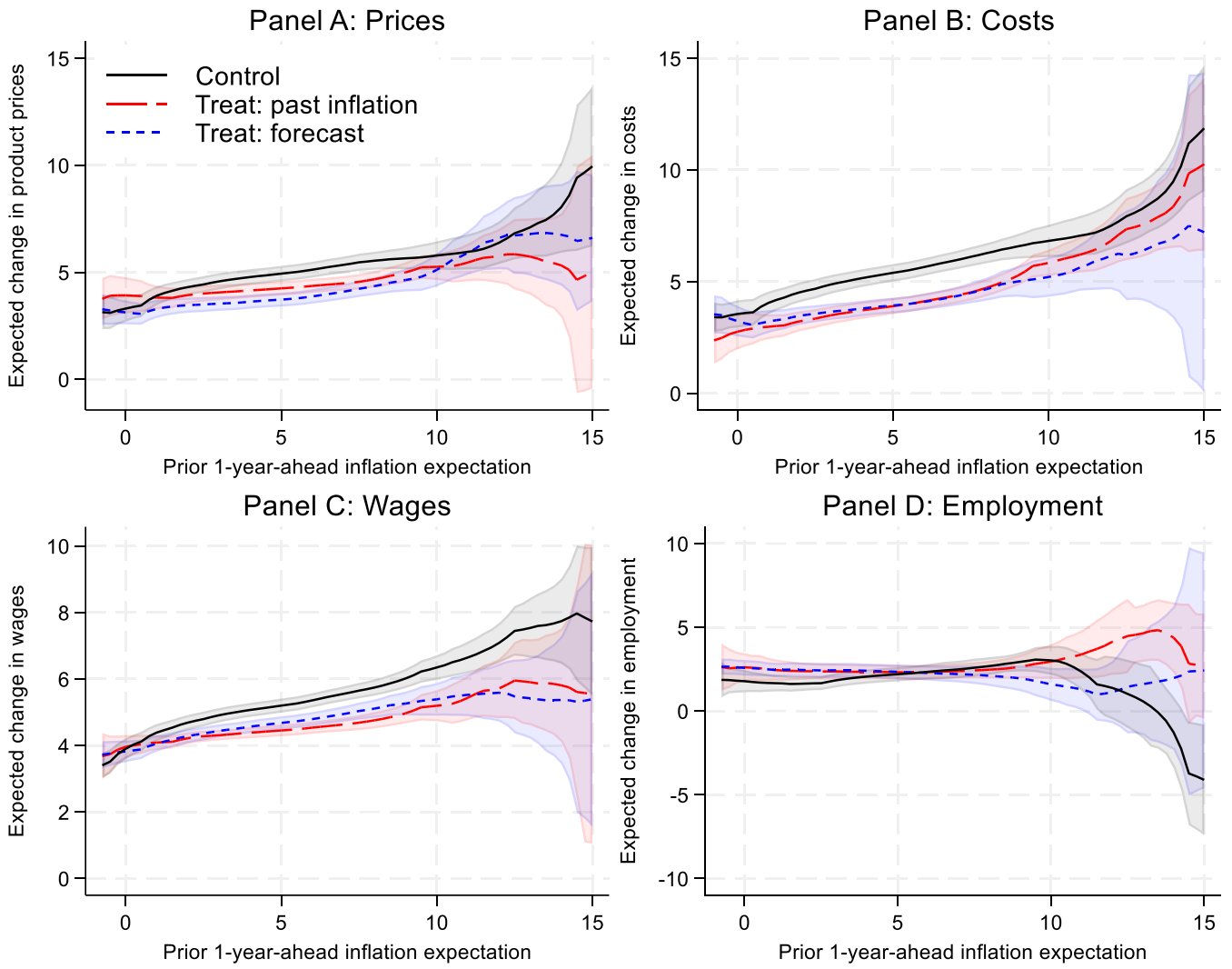
Notes: Each panel plots local polynomial regressions of a planned choice on pre-treatment (prior) inflation expectations by treatment group. Shaded regions are 90% confidence intervals.

Figure 10. Planned changes vs. actual changes

Panel A: Follow up wave in September 2023

Legend:
- △ Prices: b = 0.34 (0.04)
- □ Costs: b = 0.28 (0.05)
- ● Wages: b = 0.36 (0.04)
- × Employment: b = 0.38 (0.04)

X-axis: Planned change over next 12 months (%), June 2023
Y-axis: Planned change over next 12 months (%), September 2023

Panel B: Follow up wave in December 2023

Legend:
- △ Prices: b = 0.32 (0.06)
- □ Costs: b = 0.25 (0.05)
- ● Wages: b = 0.35 (0.06)
- × Employment: b = 0.33 (0.07)

X-axis: Planned change over next 12 months (%), June 2023
Y-axis: Ex-post reported change over 6 months (%), December 2023

Notes: The figure plots binscatters for planned changes over the next 12 months vs ex-post actual changes over the next 6 months (as reported 6 months after the planned changes) in the second follow-up wave. The lines show fitted relationships (OLS with sampling weights). Slopes and standard errors (in parentheses) are reported in the legend. Planned changes are trimmed at top and bottom 2 %.

ONLINE APPENDIX

Appendix Table 1. SAFE descriptive statistics

	Mean	St.Dev.	P10	P50	P90
Employment	862.0	9974.7	3	50	760
Export share, %	16.9	28.6	0	0	70
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				

Appendix Table 2. SAFE variables

Variable	Question	Definition
Turnover	"Has turnover increased, remained unchanged or decreased over the past six months?"	Increased [1]; Unchanged/ Decreased [0]
Labour costs	"Have labour 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]
Expected turnover	"Looking ahead, please indicate whether you think your company's turnover will increase,	Increase [1]; Unchanged/ Decrease [0]

	decrease or remain unchanged over the next six months"	
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 as 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 business partners to provide trade 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]

Appendix Table 3. Available surveys of firms' inflation expectations in euro area countries

Country/Survey name	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 €17500/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?

Appendix Table 4. Additional descriptive statistics for firms' inflation expectations

Country		1-year-ahead Multiple of 5		3-year-ahead Multiple of 5		5-year-ahead Multiple of 5	
		EA	National	EA	National	EA	National
		(1)	(2)	(3)	(4)	(5)	(6)
Euro area	Jun-23	0.18	0.06	0.13	0.04	0.11	0.04
	Dec-23	0.17	0.06	0.13	0.04	0.14	0.04
Austria	Jun-23	0.17	0.08	0.14	0.05	0.11	0.02
	Dec-23	0.21	0.05	0.18	0.03	0.15	0.02
Belgium	Jun-23	0.18	0.04	0.16	0.03	0.17	0.03
	Dec-23	0.15	0.03	0.18	0.04	0.20	0.03
Germany	Jun-23	0.23	0.07	0.15	0.06	0.12	0.05
	Dec-23	0.21	0.05	0.17	0.04	0.19	0.03
Spain	Jun-23	0.11	0.04	0.07	0.02	0.08	0.02
	Dec-23	0.13	0.04	0.08	0.02	0.08	0.02
Finland	Jun-23	0.13	0.06	0.08	0.03	0.09	0.05
	Dec-23	0.11	0.05	0.08	0.03	0.08	0.03
France	Jun-23	0.19	0.07	0.13	0.04	0.12	0.04
	Dec-23	0.19	0.06	0.12	0.04	0.15	0.05
Greece	Jun-23	0.16	0.04	0.14	0.03	0.14	0.03
	Dec-23	0.19	0.06	0.09	0.03	0.08	0.03
Ireland	Jun-23	0.26	0.04	0.14	0.05	0.13	0.04
	Dec-23	0.25	0.10	0.19	0.07	0.21	0.06
Italy	Jun-23	0.12	0.06	0.11	0.04	0.09	0.03
	Dec-23	0.11	0.07	0.08	0.04	0.07	0.05
Netherlands	Jun-23	0.22	0.07	0.15	0.04	0.12	0.03
	Dec-23	0.25	0.06	0.23	0.04	0.24	0.05
Portugal	Jun-23	0.14	0.05	0.04	0.01	0.04	0.01
	Dec-23	0.11	0.05	0.07	0.03	0.08	0.03
Slovakia	Jun-23	0.21	0.08	0.16	0.07	0.15	0.05
	Dec-23	0.22	0.06	0.13	0.04	0.15	0.02

Notes: The table reports the share of survey responses that are multiples of 5.

Appendix Table 5. Randomisation of group assignment

	Group assignment			
	Control	Treat with past inflation	Treat with inflation forecast	National inflation
	(1)	(2)	(3)	(4)
Male	0.01	-0.02	-0.01	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Turnover (omitted category: €2-10 million)				
€10-50 million	0.02	0.03	-0.03	-0.02
	(0.03)	(0.04)	(0.03)	(0.03)
€50 million or more	-0.02	-0.04	0.02	0.04
	(0.05)	(0.05)	(0.05)	(0.05)
€0.5 million or less	0.05	0.03	-0.05	-0.03
	(0.04)	(0.03)	(0.03)	(0.03)
€0.5-1 million	-0.02	0.04	-0.00	-0.01
	(0.03)	(0.04)	(0.03)	(0.03)
€1-2 million	0.02	-0.01	-0.02	0.01
	(0.03)	(0.03)	(0.03)	(0.03)
No. of employees (omitted category: 1-9)				
From 10 employees to 49 employees	0.02	0.01	-0.02	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
From 50 employees to 249 employees	-0.01	0.02	0.01	-0.02
	(0.04)	(0.04)	(0.03)	(0.03)
250 employees or more	0.01	0.10*	-0.06	-0.04
	(0.05)	(0.06)	(0.04)	(0.05)
Sector (omitted category: industry)				
Construction	0.03	0.01	-0.04	-0.00
	(0.03)	(0.04)	(0.03)	(0.03)
Trade	0.04	-0.00	-0.02	-0.02
	(0.03)	(0.03)	(0.03)	(0.03)
Services	0.04	-0.03	-0.01	0.01
	(0.03)	(0.03)	(0.03)	(0.03)
Firm age (omitted category: 10 years or more)				
5-10 years	0.01	0.02	-0.02	-0.00
	(0.04)	(0.04)	(0.03)	(0.04)
2-5 years	-0.06	0.06	0.07	-0.07*
	(0.04)	(0.05)	(0.07)	(0.04)
Less than 2 years	0.05	0.23**	-0.14***	-0.13*
	(0.10)	(0.11)	(0.04)	(0.07)
Job title (omitted category: CEO)				
Owner	0.01	0.03	-0.01	-0.03
	(0.03)	(0.03)	(0.03)	(0.03)
CFO	0.04	0.01	-0.03	-0.02
	(0.04)	(0.03)	(0.03)	(0.04)
Other	0.00	0.03	-0.00	-0.03
	(0.03)	(0.03)	(0.03)	(0.04)
Country (omitted category: Austria)				
Belgium	-0.06	0.04	0.02	-0.01
	(0.04)	(0.05)	(0.05)	(0.05)
Germany	-0.01	0.04	-0.01	-0.02
	(0.04)	(0.04)	(0.04)	(0.04)
Spain	-0.00	0.02	-0.01	-0.01
	(0.04)	(0.04)	(0.04)	(0.04)
Finland	-0.03	0.01	0.03	-0.01
	(0.05)	(0.05)	(0.05)	(0.05)
France	-0.03	0.01	0.03	0.00
	(0.04)	(0.04)	(0.04)	(0.04)
Greece	-0.03	0.03	0.00	-0.00
	(0.04)	(0.04)	(0.04)	(0.04)
Ireland	0.01	0.02	-0.01	-0.02
	(0.05)	(0.05)	(0.05)	(0.05)
Italy	-0.03	0.02	0.00	0.01
	(0.04)	(0.04)	(0.04)	(0.04)
Netherlands	-0.00	0.01	0.00	-0.00
	(0.05)	(0.04)	(0.04)	(0.04)
Portugal	-0.03	0.03	0.03	-0.03
	(0.05)	(0.04)	(0.04)	(0.04)
Slovakia	-0.01	0.04	0.01	-0.03
	(0.05)	(0.05)	(0.05)	(0.05)
Observations	5,733	5,733	5,733	5,733
R-squared	0.01	0.01	0.01	0.01
F-statistic	0.854	0.623	1.145	0.562
p-value(F-statistic)	0.697	0.949	0.265	0.976

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.

Appendix Table 6. Predictors of inflation expectations (1 year ahead), Huber

	Managers' demographics	Firms' demographics	Firm outlook variables	All
	(1)	(2)	(3)	(4)
Female	0.50***			0.44***
	(0.11)			(0.11)
Job title (omitted category: owner)				
Finance manager	-0.40***			0.08
	(0.12)			(0.14)
CEO	-0.12			0.10
	(0.15)			(0.15)
Other	-0.09			0.24*
	(0.13)			(0.14)
No. of employees (omitted category: 1 to 9 employees)				
From 10 employees to 49 employees		-0.09		-0.09
		(0.14)		(0.14)
From 50 employees to 249 employees		-0.30*		-0.25
		(0.18)		(0.18)
250 employees or more		-0.40		-0.34
		(0.25)		(0.25)
A subsidiary of another enterprise		-0.15		-0.19
		(0.13)		(0.13)
Sector (omitted category: industry)				
Construction		-0.05		-0.07
		(0.17)		(0.17)
Trade		-0.11		-0.18
		(0.13)		(0.13)
Services		-0.11		-0.13
		(0.12)		(0.12)
more than 500 thousand and up to 1 million euros		0.19		0.12
		(0.16)		(0.16)
more than 1 million and up to 2 million euros		-0.46***		-0.49***
		(0.17)		(0.17)
more than 2 million and up to 10 million euros		-0.27		-0.34*
		(0.17)		(0.18)
more than 10 million and up to 50 million euros		-0.21		-0.28
		(0.21)		(0.22)
more than 50 million euros		-0.36		-0.44*
		(0.26)		(0.26)
Log(age)		-0.02		-0.01
		(0.06)		(0.06)
Ownership (omitted category: autonomous enterprise)				
Public shareholders, company is listed on the stock market		-0.28		-0.29
		(0.30)		(0.30)
Family or entrepreneurs		-0.18*		-0.17*
		(0.10)		(0.10)
Other firms or business associates		-0.22		-0.27*
		(0.15)		(0.15)
Venture capital firms or business angels		-0.13		-0.22
		(0.43)		(0.43)
Export share (omitted category: no export)		-0.11		-0.09
Less than 25%		(0.25)		(0.25)
		-0.13		-0.13
Between 25% and 50%		(0.11)		(0.11)

	(1)	(2)	(3)	(4)
Over 50%			0.23	0.26*
			(0.16)	(0.16)
			-0.02	-0.02
Firm-specific increase in:				
Turnover			-0.02	-0.03
			(0.08)	(0.08)
Labour cost			-0.24**	-0.18
			(0.11)	(0.11)
Other cost			-0.02	-0.07
			(0.07)	(0.08)
Interest expenses			-0.09	-0.04
			(0.08)	(0.08)
Profits			-0.05	-0.02
			(0.10)	(0.10)
Fixed investment			-0.08	-0.03
			(0.10)	(0.10)
Inventories/Working capital			-0.04	0.01
			(0.10)	(0.10)
Employees			-0.12	-0.11
			(0.15)	(0.15)
Leverage			-0.02	-0.03
			(0.08)	(0.08)
Expected turnover			-0.24**	-0.18
			(0.11)	(0.11)
Expected investments			-0.02	-0.07
			(0.07)	(0.08)
Macro outlook			-0.09	-0.04
			(0.08)	(0.08)
Public financial support			-0.05	-0.02
			(0.10)	(0.10)
Firm-specific outlook			-0.08	-0.03
			(0.10)	(0.10)
Firm capital			-0.04	0.01
			(0.10)	(0.10)
Firm credit history			-0.12	-0.11
			(0.15)	(0.15)
Willingness firm trade credit			-0.02	-0.03
			(0.08)	(0.08)
Willingness banks credit			-0.24**	-0.18
			(0.11)	(0.11)
Willingness partners			-0.02	-0.07
			(0.07)	(0.08)
Country fixed effects	Yes	Yes	Yes	Yes
Technical survey controls	Yes	Yes	Yes	Yes
Observations	3,041	3,041	3,041	3,041
R^2	0.15	0.16	0.15	0.18

Notes: the table reports estimates for Huber-robust regressions where the dependent variable in one-year-ahead inflation expectations and regressors are firm and manager characteristics. Robust standard errors are in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Appendix Table 7. Causal effects of inflation expectations on firms' plans and reported actions (follow-up)

|	Change in plans in three months for next 12 months				Change in reported outcomes over past 6 months			
	Prices	Costs	Wages	Employment	Prices	Costs	Wages	Employment
	(1)	(2)	(3)	(4)	(5)	(6)	(3)	(4)
Panel A. No controls								
Posterior $E_{i,t}^{post}\pi_{t+h}$	0.24	0.12	0.00	0.22	0.63*	-0.68**	-0.31	-0.40
	(0.35)	(0.32)	(0.21)	(0.28)	(0.36)	(0.31)	(0.23)	(0.41)
Observations	753	742	789	725	320	309	324	311
R-squared	0.02	0.04	0.12	0.02	0.08	0.09	0.16	0.07
1st stage F-stat	56.05	49.19	62.77	63.72	20.03	25.48	31.25	28.91
Panel B. Controls included								
Posterior $E_{i,t}^{post}\pi_{t+h}$	0.02	-0.03	0.05	0.38	0.49	-0.13	-0.14	0.00
	(0.32)	(0.31)	(0.20)	(0.30)	(0.34)	(0.30)	(0.24)	(0.40)
Observations	753	745	791	725	320	301	312	306
R-squared	0.09	0.16	0.17	0.07	0.19	0.21	0.38	0.14
1st stage F-stat	61.39	56.18	60.36	59.55	21.59	20.02	17.95	26.05

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, the following variable are included as controls: firm's age, sector, turnover and employment. Panel C is restricted to the control group and the treatment group where firms are informed about past inflation. Panel D is restricted to the control group and the treatment group where firms are informed about an inflation forecast. Robust standard errors are reported in parentheses. ***,**,* denote statistical significance at 1, 5, and 10 percent levels.

Appendix Table 8. Second-stage regression by firm characteristics

|	Prices		Costs		Wages		Employment	
	Coef. (s.e.)	N obs {F-stat}	Coef. (s.e.)	N obs {F-stat}	Coef. (s.e.)	N obs {F-stat}	Coef. (s.e.)	N obs {F-stat}
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size (employment)								
1-9	0.04	933	0.51*	947	0.30**	934	0.08	901
	(0.24)	{147.8}	(0.26)	{145.2}	(0.14)	{139.8}	(0.33)	{123.3}
10-50	0.28	770	0.72***	781	0.12	775	0.25	755
	(0.29)	{108.3}	(0.29)	{99.2}	(0.17)	{93.4}	(0.35)	{101.0}
51+	0.94***	977	0.75***	996	0.08	992	0.86***	952
	(0.32)	{95.8}	(0.29)	{95.6}	(0.18)	{99.8}	(0.35	{82.4}
Firm age								
Below 15 years	0.33	591	0.84***	600	0.16	595	-0.02	580
	(0.32)	{68.9}	(0.32)	{74.5}	(0.20)	{71.8}	(0.44)	{66.2}
15-25 years	0.91***	693	0.60**	706	0.42**	701	0.82*	675
	(0.27)	{108.4}	(0.28)	{109.6}	(0.19)	{106.2}	(0.43)	{76.1}
25-40 years	-0.06	653	0.32	662	-0.24	657	0.16	633
	(0.36)	{105.4}	(0.34)	{99.0}	(0.18)	{92.9}	(0.32)	{96.1}
Above 40 years	0.91***	655	0.89***	666	0.37*	661	0.01	637
	(0.35)	{79.9}	(0.31)	{76.5}	(0.19)	{84.6}	(0.40)	{75.6}
Size (total assets, Orbis)								
Below 500k	-0.04	365	0.45	371	0.16	370	-0.30	356
	(0.33)	{83.5}	(0.36)	{89.5}	(0.26)	{89.7}	(0.63)	{52.7}
500k-20m	0.26	470	0.64**	473	0.19	468	0.29	455
	(0.32)	{88.8}	(0.30)	{85.9}	(0.17)	{87.8}	(0.41)	{92.4}
20m-100m	-0.01	507	0.38	517	0.13	513	0.82*	492
	(0.40)	{53.8}	(0.33)	{54.7}	(0.24)	{49.0}	(0.48)	{47.9}
100m-	1.09**	452	0.96	461	0.01	456	1.02*	439
	(0.56)	{36.7}	(0.61)	{36.8}	(0.25)	{36.4}	(0.59)	{32.7}
Leverage (Orbis)								
Below 1/3	0.53	379	0.83*	381	0.45	381	-0.10	366
	(0.58)	{46.5}	(0.49)	{45.3}	(0.33)	{42.1}	(0.60)	{41.0}
1/3-1/2	0.01	341	0.19	346	0.16	343	0.82	330
	(0.39)	{39.2}	(0.38)	{42.2}	(0.27)	{43.7}	(0.58)	{35.6}
1/2-3/4	0.10	556	0.66	561	-0.15	561	0.45	540
	(0.38)	{58.8}	(0.44)	{57.6}	(0.19)	{60.5}	(0.48)	{57.3}
3/4-2	0.43	492	0.45	506	0.15	494	0.92**	479
	(0.33)	{64.3}	(0.33)	{65.8}	(0.21)	{61.6}	(0.44)	{67.7}
Sector								
Industry	0.45	668	0.82***	680	0.07	675	0.46	654
	(0.34)	{77.7}	(0.34)	{77.1}	(0.17)	{65.2}	(0.38)	{69.6}
Construction	1.13*	298	0.97*	302	0.24	296	0.43	288
	(0.67)	{39.1}	(0.53)	{39.2}	(0.41)	{36.9}	(0.56)	{36.2}
Trade	-0.03	605	0.07	612	-0.22	613	0.13	586
	(0.34)	{64.4}	(0.35)	{63.4}	(0.15)	{65.9}	(0.4)	{61.8}
Services	0.48**	1,109	0.77***	1,130	0.39***	1,117	0.38	1,080
	(0.24)	{173.5}	(0.24)	{167.6}	(0.16)	{174.6}	(0.34)	{142.6}
Country group								
Core (North)	0.60***	1,493	0.79***	1,512	0.12	1,502	0.44	1,448
	(0.23)	{156.9}	(0.22)	{150.0}	(0.14)	{143.8}	(0.29)	{142.7}
Periphery (South)	-0.01	1,085	0.46*	1,106	0.21*	1,093	0.3	1,058
	(0.23)	{157.9}	(0.26)	{158.0}	(0.12)	{164.2}	(0.29	{137.7}
Export share								
None	0.25	1,334	0.67***	1,360	0.09	1,349	0.38	1,298
	(0.2)	{221.5}	(0.2)	{220.3}	(0.12)	{226.2}	(0.24)	{190.9}
1%-25%	0.32	661	-0.03	671	0.2	662	0.57	644
	(0.34)	{71.5}	(0.34)	{72.7}	(0.2)	{67.4}	(0.46)	{66.8}
26%+	1.22***	669	1.51***	677	0.47**	676	0.25	651
	(0.49)	{51.6}	(0.45)	{49.8}	(0.23)	{47.9}	(0.53)	{52.8}
Level of inflation								
High (5%+)	0.44*	1,188	0.83***	1,208	0.31**	1,193	0.54*	1,146
	(0.24)	{153.4}	(0.24)	{150.6}	(0.15)	{144.5}	(0.29)	{141.4}
Low (less than 5%)	0.3	1,492	0.49**	1,516	0	1,508	0.1	1,462
	(0.22)	{185.5}	(0.23)	{183.1}	(0.11)	{184.4}	(0.27)	{166.6}

Notes: See Table 7. 1st stage F-statistic are reported in curly parentheses.

*Appendix Figure 1. 3-year-ahead inflation expectations, euro area vs national*
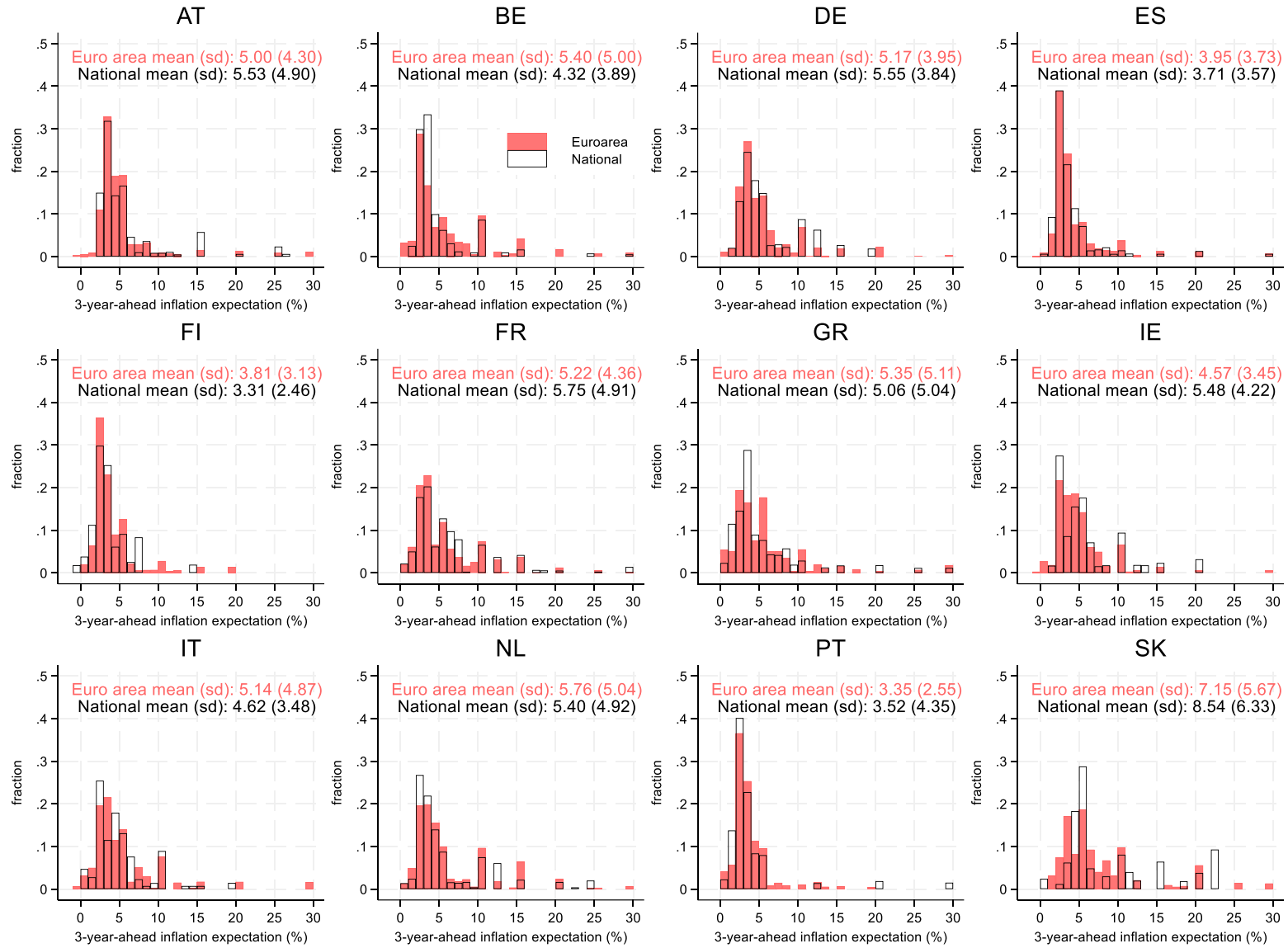
Notes: The distributions are trimmed at -1 and 30 percent.

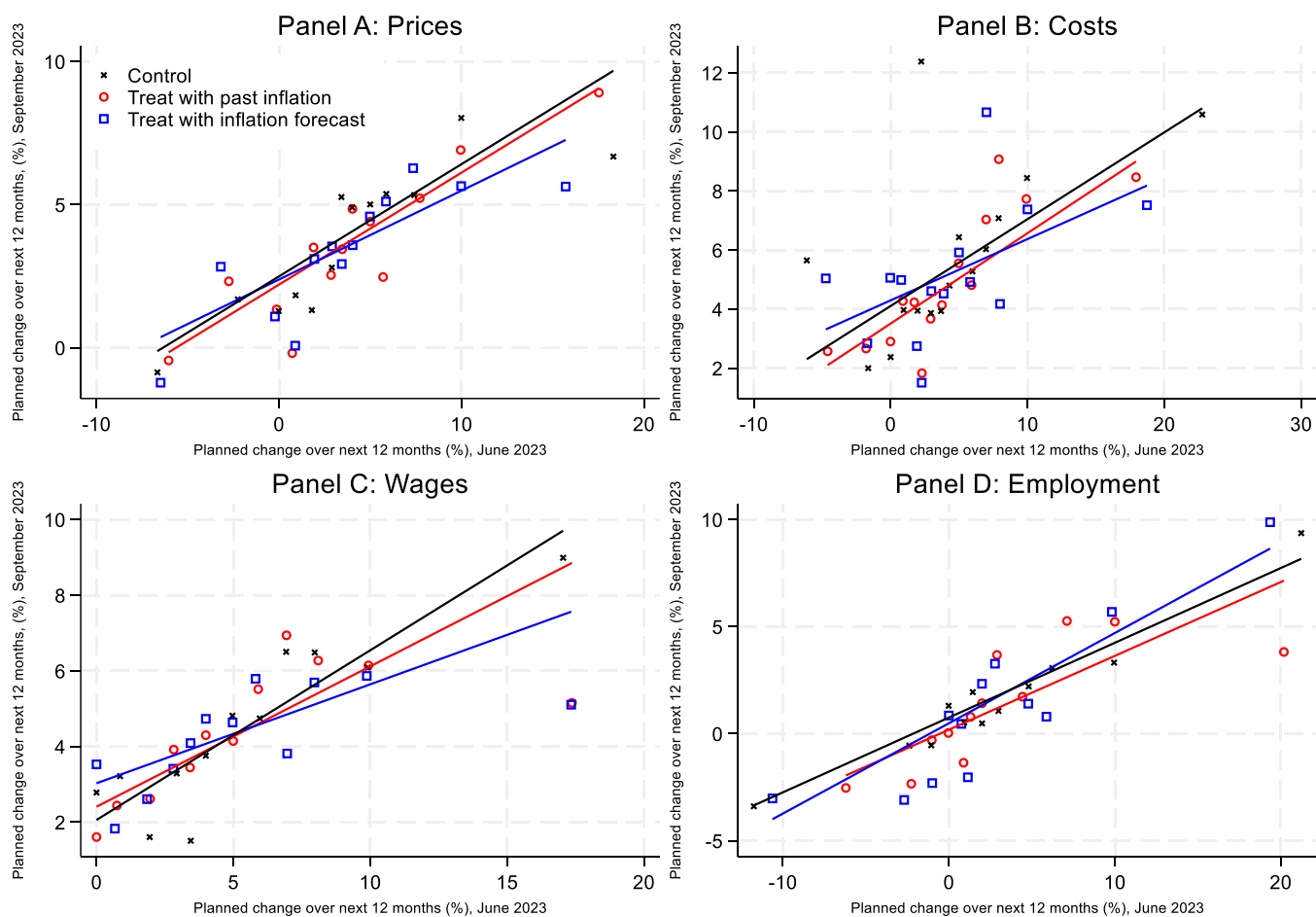*Appendix Figure 2. 5-year-ahead inflation expectations, euro area vs national*
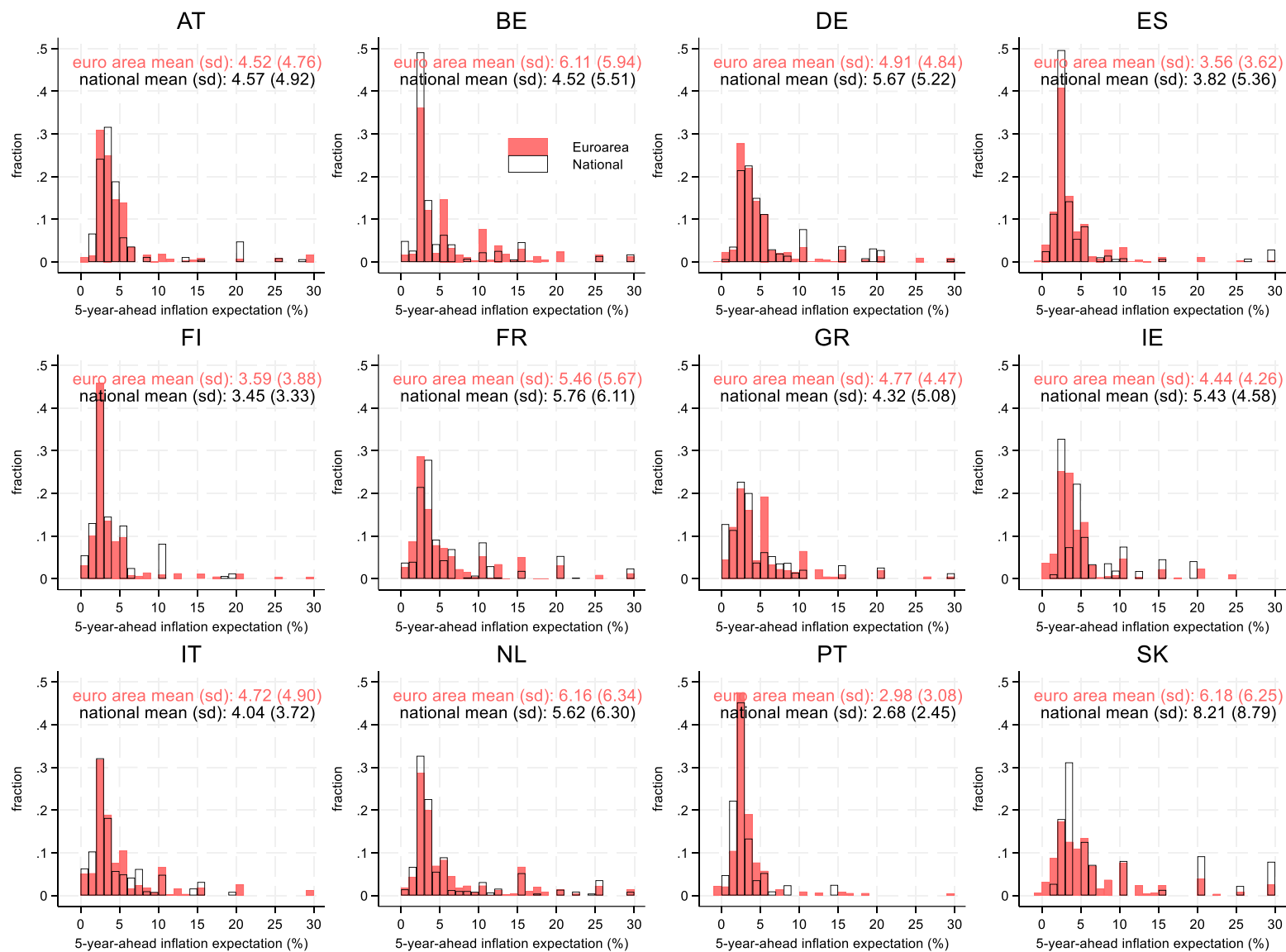
Notes: The distributions are trimmed at -1 and 30 percent.

Appendix Figure 3. Mean and median expectations for euro-area and national inflation rates by country and horizon
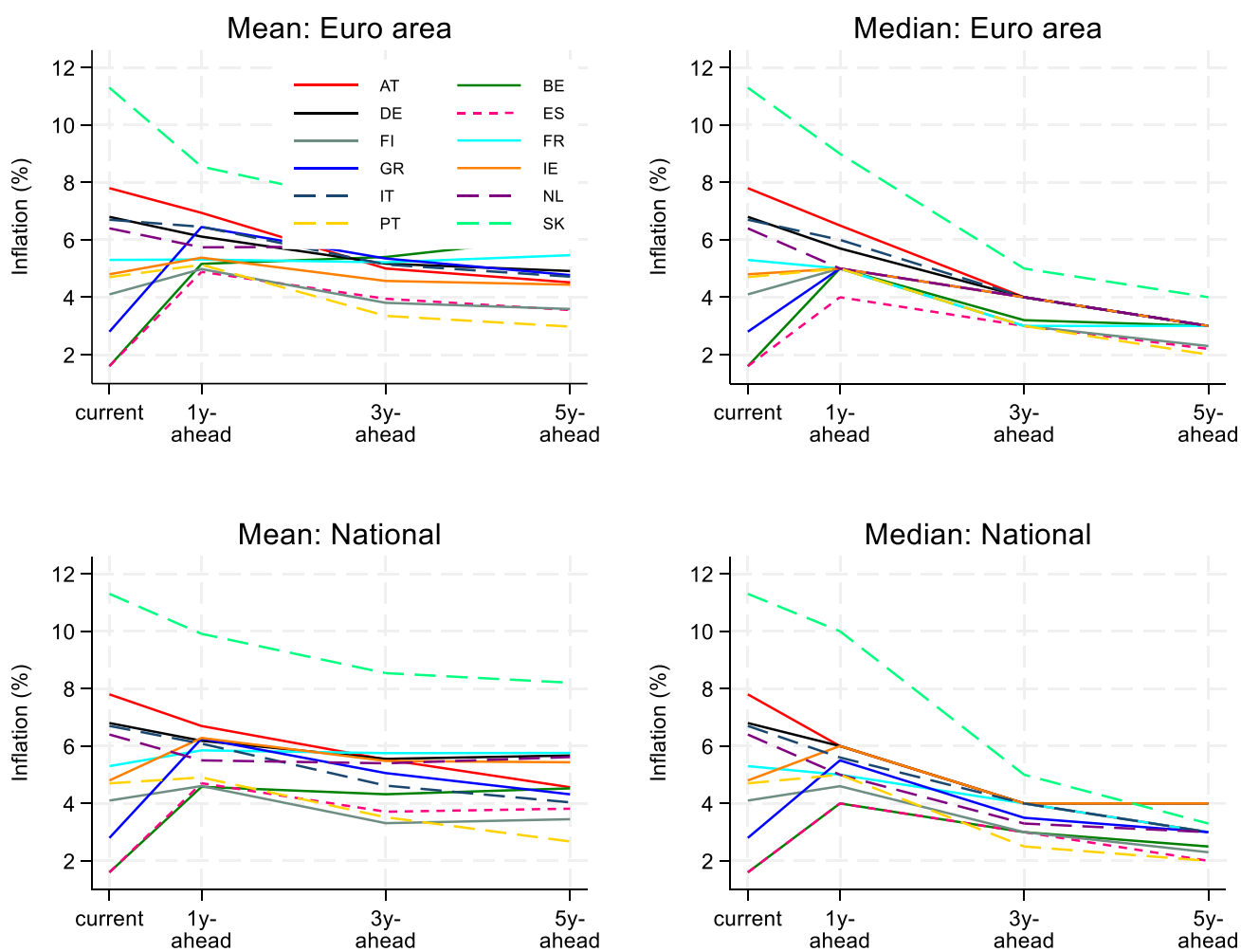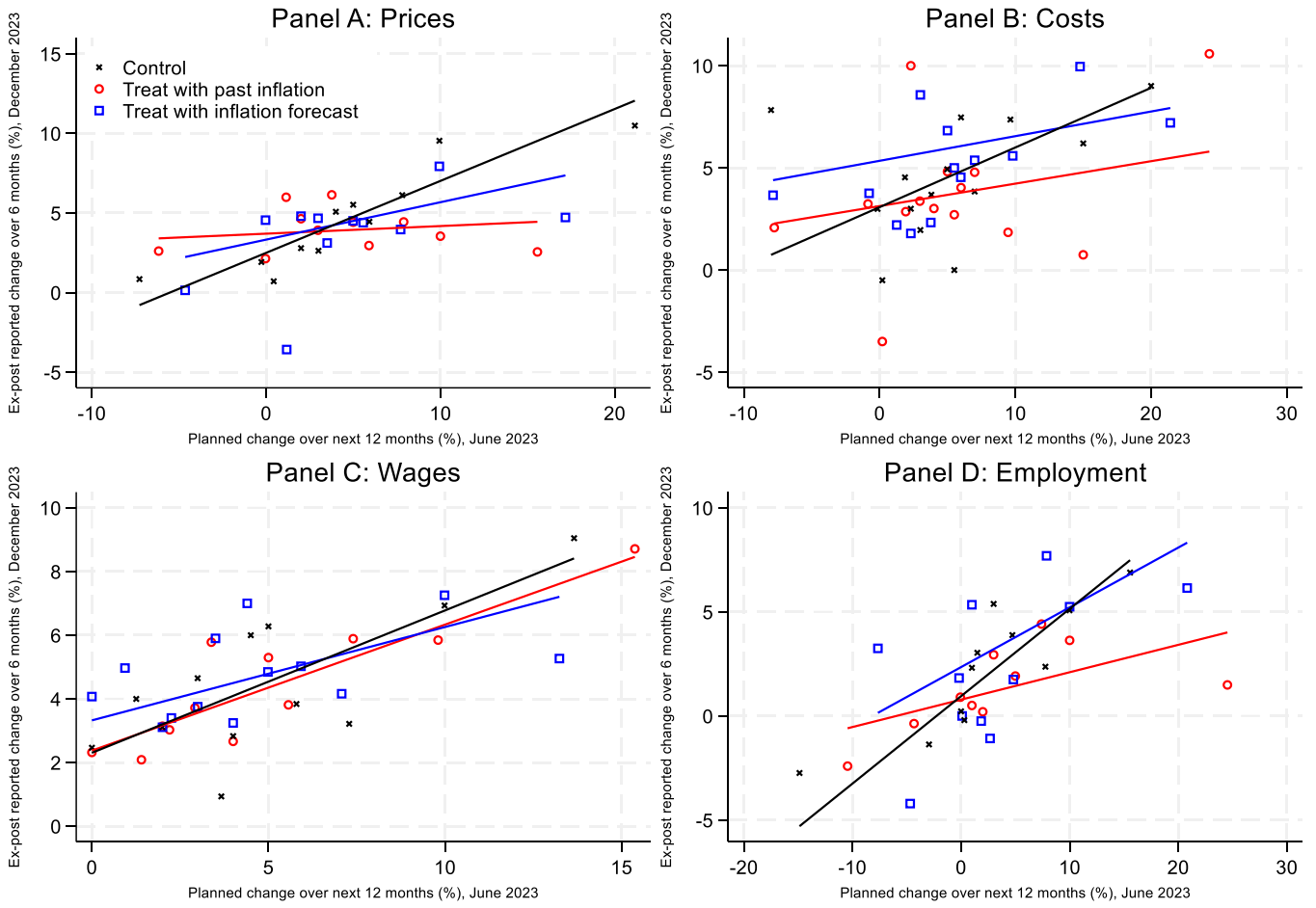
*Appendix Figure 4. Planned vs. planned changes in the next survey round by treatment group*

Notes: See notes to Figure 10.

Appendix Figure 5. Planned vs. actual changes by treatment group

Panel A: Prices

Panel B: Costs

Panel C: Wages

Panel D: Employment

- Control
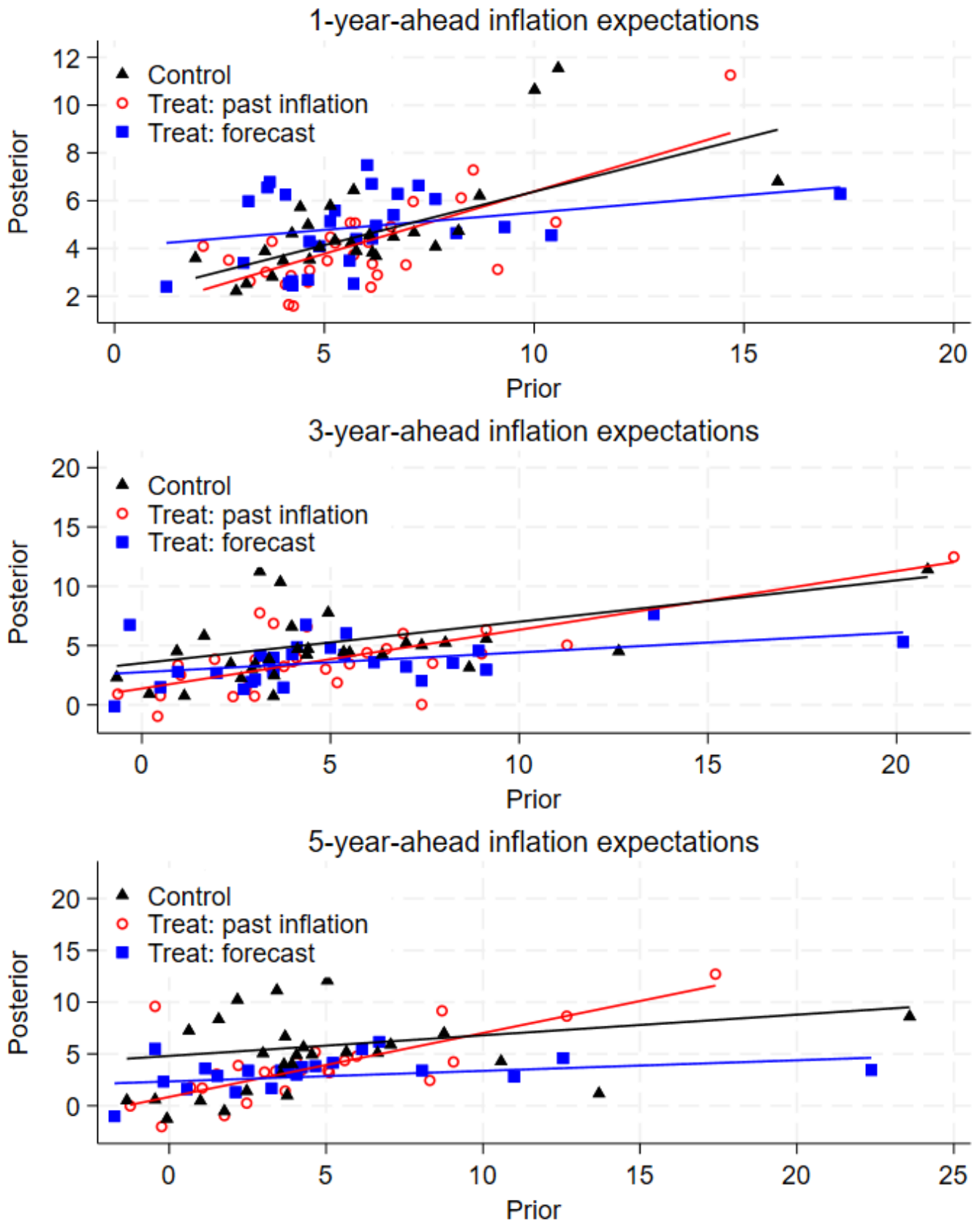- Treat with past inflation
- Treat with inflation forecast

Notes: See notes to Figure 10.

Appendix Figure 6. Posterior inflation expectations by country and treatment group
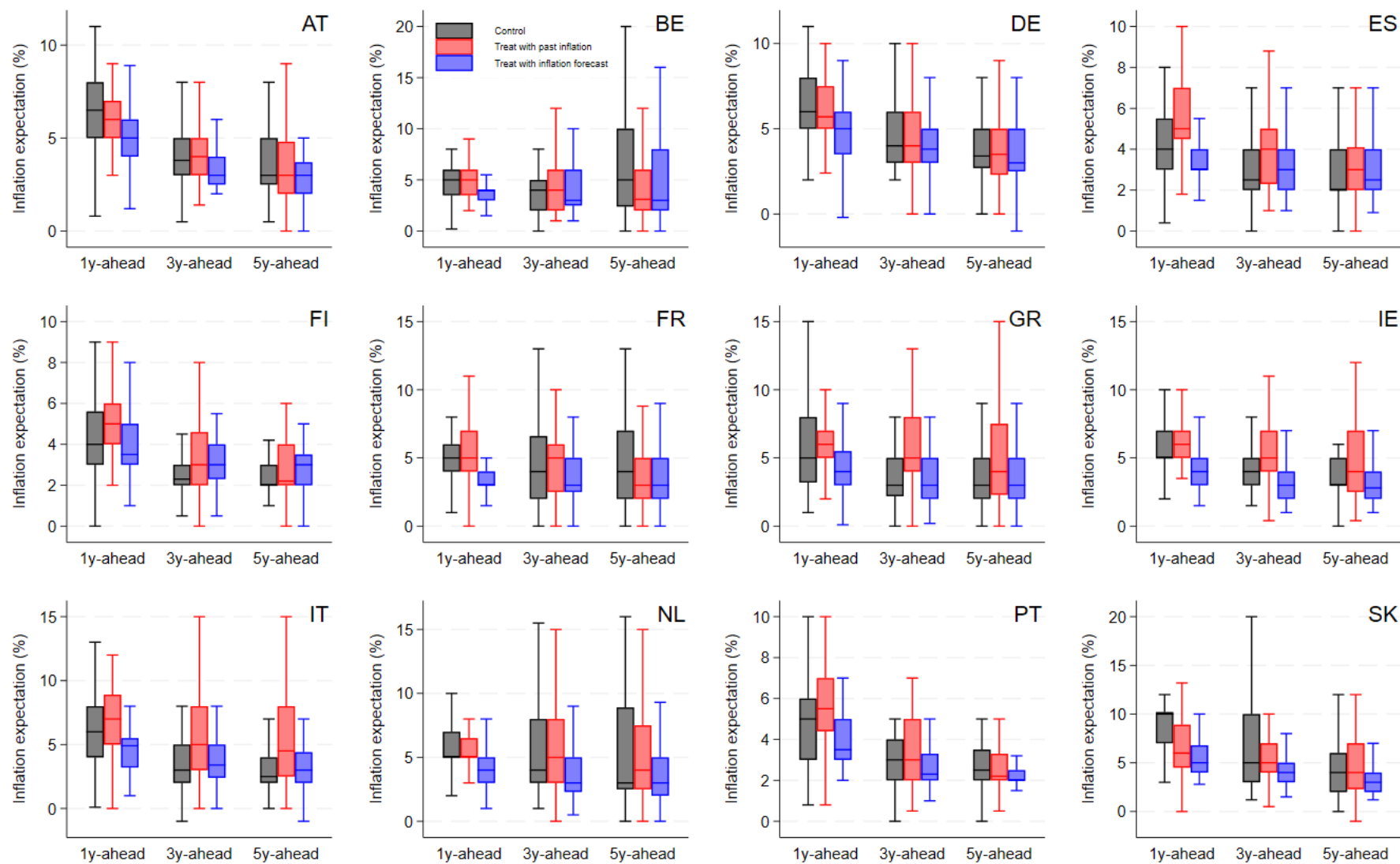
Notes: The figure reports box plots for posterior beliefs (measured immediately after information treatments) by country and treatment group. The whiskers indicate $median \pm (3/2) \times IRQ$. The upper and lower bars of each box indicate P75 and P25. Horizontal lines within boxes indicate medians.

Appendix Figure 7. Binscatter of posterior vs. prior inflation expectations by treatment group and forecast horizon. follow-up wave in December 2023

Notes: Each panel is a binscatter plot of prior vs posterior beliefs. Huber weights are applied to minimise the influence of outliers.