# The asymmetric and heterogeneous pass-through of input prices to firms' expectations and decisions*

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**Abstract**

This paper studies the pass-through of input price shocks to firms' expectations and pricing decisions using firm-level data from the Bank of Italy's Survey on Inflation and Growth Expectations (SIGE). We identify exogenous cost shocks via forecast errors in firms' input price expectations and estimate their causal effects on firm behavior. We find a strong and asymmetric pass-through: positive input price shocks significantly raise firms' price expectations, realized prices, and short-term inflation expectations, while negative shocks have little impact. The strength of the pass-through varies systematically with macroeconomic conditions and firm characteristics. During high-inflation periods, firms' expectations are primarily driven by macroeconomic shocks rather than their own business conditions. Moreover, the pass-through is stronger among firms facing greater uncertainty, more frequent price adjustments, lower profit margins, or stronger financial positions. Firms in less competitive markets also exhibit a higher degree of pass-through. Finally, we show that providing firms with information about current inflation dampens the pass-through to inflation expectations, underscoring the importance of central bank communication in anchoring expectations and mitigating inflation persistence.

**Keywords:** Pass-through, cost shocks, heterogeneous firm expectations, survey data, inflation.

**JEL classification:** D22, D84, E31, E50

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# 1 Introduction

The pass-through of input prices to firms' expectations is of critical importance to firms' spending and pricing plans, particularly at times of growing inflationary pressures and supply chain disruptions. How firms translate changes in input costs into expectations about their own prices—and ultimately into pricing decisions and views about the broader economy—is essential for central banks aiming to understand the drivers of inflation and design effective monetary policies. In this respect, key dimensions of this transmission include the magnitude of the pass-through, whether it is symmetric for cost increases and decreases, and how it varies with macroeconomic conditions such as inflation. Moreover, heterogeneity in firm characteristics—such as financial constraints or market power—may shape how price expectations and decisions respond to input cost shocks, raising the possibility that central banks could influence this process through targeted communication. Despite its relevance, empirical evidence on these questions remains scarce, primarily due to data limitations.

In this paper, we investigate the transmission of input price shocks to firms' expectations and pricing decisions. Leveraging detailed firm-level data from the Bank of Italy's Survey on Inflation and Growth Expectations (SIGE), we exploit forecast errors in firms' own input price expectations—measured as the difference between realised and expected input price growth—to identify exogenous input cost shocks. This approach enables us to isolate the causal effect of input price changes on firms' expectations and price setting behavior, aligning with methodologies widely adopted in recent literature (Parlapiano, 2024, Bunn et al., 2025, Alati et al., 2024, Barrero, 2022, Bachmann et al., 2021).

Our findings point to a strong pass-through from input prices to firms' own price expectations and realisations. We document that a surprise change in expected input price by 1 percentage point leads to a 0.3 percentage point rise in firms' own expected price growth and a 0.2 percentage point increase in realised price growth one year later. Beyond expectations of firms' own prices, we document significant effects on expectations of aggregate inflation: firms revise upwards their 6- and 12-month-ahead inflation expectations in response to input price shocks, even though longer-term expectations (24 months and beyond) remain well-anchored. Importantly, we also find that the pass-through is highly asymmetric, with positive input price shocks driving expectation revisions, while negative shocks having little to no impact. This result aligns with existing evidence on asymmetric price adjustments (Peltzman, 2000, Buckle and Carlson, 2000, Benzarti et al., 2020).

We then examine heterogeneity in the pass-through, focusing on the role of macroeconomic conditions and firm-level characteristics. During periods of high inflation, firms appear to place less weight on signals related to their own business conditions—such as input costs—and instead rely more heavily on aggregate inflation signals when forming expectations. This behavior is consistent with models of rational inattention, where firms economize on information processing by focusing on broader economic indicators in volatile environments.

The strength of the pass-through also varies systematically with firm characteristics such as size, sector, uncertainty, pricing behavior, market power, and financial conditions. For instance, the pass-through to realized price changes is stronger among firms in manufacturing and industrial sectors, particularly those positioned upstream in the supply chain. Firms facing higher uncertainty also exhibit a stronger pass-through, possibly reflecting larger or more volatile cost shocks that necessitate more flexible pricing responses. Moreover, firms with a history of frequent price adjustments show greater sensitivity to input cost shocks, suggesting that pricing flexibility enables quicker and more responsive pass-through, potentially to maintain competitiveness. We also find that firms operating in less competitive markets—proxied by high markups—exhibit a stronger pass-through, as do firms with thinner profit margins or stronger financial positions (e.g., higher liquidity ratios). These patterns indicate that both market power and cost absorption capacity shape how input shocks are transmitted to prices, with financially unconstrained firms better able to adjust prices proactively in response to cost pressures.

Finally, we provide supporting evidence for the relevance of central bank communication.

We find that providing firms with information about the current level of inflation significantly dampens the pass-through of input price shocks to inflation expectations. This suggests that effective monetary policy communication helps keeping inflation expectations anchored, particularly in high-inflation environments, and underscores the role of central banks in stabilising economic sentiment.

The strong and asymmetric pass-through of input price shocks to firms' expectations suggests that inflationary pressures can become self-reinforcing, as firms' prices respond more aggressively to cost increases than to cost declines. This asymmetry implies that adverse supply-side shocks can have prolonged effects on inflation dynamics, complicating monetary policy responses. Moreover, the heterogeneity in pass-through across macroeconomic conditions and firm characteristics highlights the need for clear and targeted communication strategies. Notably, our evidence that central bank communication—such as providing firms with information on current inflation—can help anchor expectations suggests that transparency and effective communication play a crucial role in mitigating inflationary pressures. These results underscore the importance of complementing traditional monetary policy tools with proactive communication strategies, especially in high-inflation environments.

**Related literature**. Our findings contribute to and extend several strands of the empirical and theoretical literature on input cost pass-through, expectation formation, and pricing behavior.

First, we add to the large body of work documenting incomplete pass-through of input cost changes to output prices at both micro and macro levels.[1] Most closely related to our work, Gödl-Hanisch and Menkhoff (2024) use survey data from Germany to show that pass-through is gradual and shaped by infrequent price adjustments and coordination with competitors, distinguishing between aggregate and idiosyncratic shocks. Similarly, Riggi and Tagliabracci (2022) and Parlapiano (2024), using the same Italian survey data as we do,

[1] See, among others, Taylor (2000), Smets and Wouters (2003), Gopinath and Itskhoki (2010), Auer and Schoenle (2016), Garetto (2016), Amiti et al. (2019), Ganapati et al. (2020), Dedola et al. (2021), and Riggi and Tagliabracci (2022).

document that firms often absorb cost shocks rather than fully transmitting them to output prices.

We extend this literature in several ways. In contrast to most prior work, we link input cost shocks not only to actual price changes but also to firms' inflation expectations over multiple horizons. This allows us to examine the pass-through to both current and forward-looking pricing behavior. We also study whether pass-through is asymmetric—that is, whether firms react differently to cost increases and decreases. Finally, we explore how this transmission varies with macroeconomic conditions and firm-specific factors, including the availability of inflation information.

Second, our findings provide novel evidence on how firms form expectations. Consistent with prior work (e.g., Boneva et al., 2020; Andrade et al., 2022), we find that firms extrapolate from their own cost conditions when forming aggregate inflation expectations. Crucially, we show that input price shocks influence firms' revisions of inflation expectations. Furthermore, in line with rational inattention models (e.g., Sims, 2003; Reis, 2006; Bartosz and Wiederholt, 2009; Afrouzi, 2016), we find that this extrapolation behavior is state-dependent: it weakens in high-inflation environments, when firms shift their attention toward macroeconomic signals rather than idiosyncratic conditions.

Third, we provide empirical evidence of asymmetric pass-through of input prices, challenging the assumptions of standard New Keynesian models, such as the Calvo price-setting and menu cost models, which typically assume symmetric adjustment costs.

Our findings instead align with a range of theoretical models that allow for nonlinear and state-dependent pricing behavior. For instance, state-dependent pricing models (e.g., Dotsey et al., 1999; Golosov and Lucas, 2007) predict that firms adjust prices only when benefits outweigh menu costs. Rising input costs threaten profit margins directly, prompting price increases, while cost reductions may be absorbed to avoid frequent adjustments. Customer market models (e.g., Phelps and Winter, 1970) also imply asymmetry: firms may be reluctant to lower prices for fear of sending confusing or opportunistic signals to customers in long-term relationships. Similarly, S-s rule and kinked demand models (e.g., Ball and Mankiw, 1994; Hall, 2005) highlight how strategic complementarities, concerns about quality signaling, and menu costs lead firms to react more strongly to cost increases than to decreases. Downward price rigidity can also result from coordination frictions and wage stickiness. Additionally, financial frictions offer another mechanism for asymmetry. According to precautionary pricing theories (e.g., Gilchrist et al., 2017), liquidity-constrained firms may use cost reductions to rebuild buffers rather than lower prices, but respond aggressively to cost increases to protect cash flow. These theoretical channels help explain why we observe more pronounced price adjustments in response to rising input costs than to falling ones.

Empirically, our findings reinforce and expand upon prior evidence of non-linear pricing behavior observed in different contexts. Peltzman (2000) and Buckle and Carlson (2000) document stronger responses to positive demand shocks. Benzarti et al. (2020) find greater responsiveness to VAT increases than decreases. Bunn et al. (2025) report convex price responses to demand shocks at the firm level. Our contribution lies in showing that similar asymmetries arise in response to cost shocks, using a high-frequency panel of firm-level data that allows us to disentangle various firm-level and macroeconomic drivers.

Finally, our results speak to the literature on heterogeneity in price-setting behavior. Building on work that emphasizes the roles of financial constraints (Gilchrist et al., 2017), market power (Hensel et al., 2024), and uncertainty or volatility (Gödl-Hanisch and Menkhoff, 2024), we show that pass-through varies meaningfully with firm characteristics. Importantly, we find that providing firms with inflation information improves the anchoring of their expectations in periods of high input price volatility. This suggests that informational frictions may amplify inflation dynamics, and that targeted communication policies could play a stabilizing role.

The rest of the paper is organized as follows. Section 2 introduces the survey which we rely upon, as well as the dataset including firm-level characteristics. Section 3 presents our empirical results. In Section 4 we perform a battery of robustness checks. Section 5 concludes.

# 2 Data

## 2.1 Survey on Inflation and Growth Expectations

Data on firms' expectations are drawn from the Survey on Inflation and Growth Expectations (SIGE), which is ran at quarterly frequency by the Bank of Italy since 1999. The survey is designed to be nationally representative, stratifying the sample based on three key firm characteristics: sector of activity, size class (determined by the number of employees)[2], and geographical area (based on the firm's administrative headquarters). Each quarter, approximately 1,500 Italian firms are surveyed on both aggregate and business-specific variables.

The SIGE has been widely used in the academic literature[3]. The dataset's rich time-series and panel structure make it particularly well-suited for analyzing the pass-through of input prices to firms' expectations and decision-making processes.

In this paper, we primarily focus on the following questions, which pertain to firms' expectations regarding the expected and realised growth of their own input prices, the price growth of their output, and future inflation:

- *In the last 12 months, what has been the average change in your firm's prices of goods and services bought in Italy and abroad?*
- *In the next 12 months, what do you expect will be the average change in your firm's prices of goods and services bought in Italy and abroad?*
- *In the last 12 months, what has been the average change in your firm's prices?*

[2] The survey is conducted only on firms with at least 50 employees.

[3] See, among others, Coibion et al. (2020), Bottone et al. (2021), Ropele et al. (2022), Bottone et al. (2022), Ropele and Tagliabracci (2024), and Ropele and Tagliabracci (2024).

- *For the next 12 months, what do you expect will be the average change in your firm's prices?*

- *What do you think the consumer price inflation will be in Italy: In six months? In one year? In two years? On average between three and five years?*

Firms respond to the SIGE questions by reporting the approximate percentage variation.[4]

To single out unexpected changes in input prices experienced by firms, we use their input price forecast errors.[5] Forecast errors are defined as the difference between the realised price growth between $t-12$ and $t$, and what firms had expected in $t-12$ for the same period. The questions on input price growth were introduced at the end of 2016, hence relying on input price forecast errors effectively restricts the sample from 2017Q3 to 2024Q1. Throughout this period, the SIGE includes around 25,000 firm-level observations, with each firm participating in the survey for an average of 18 quarters.

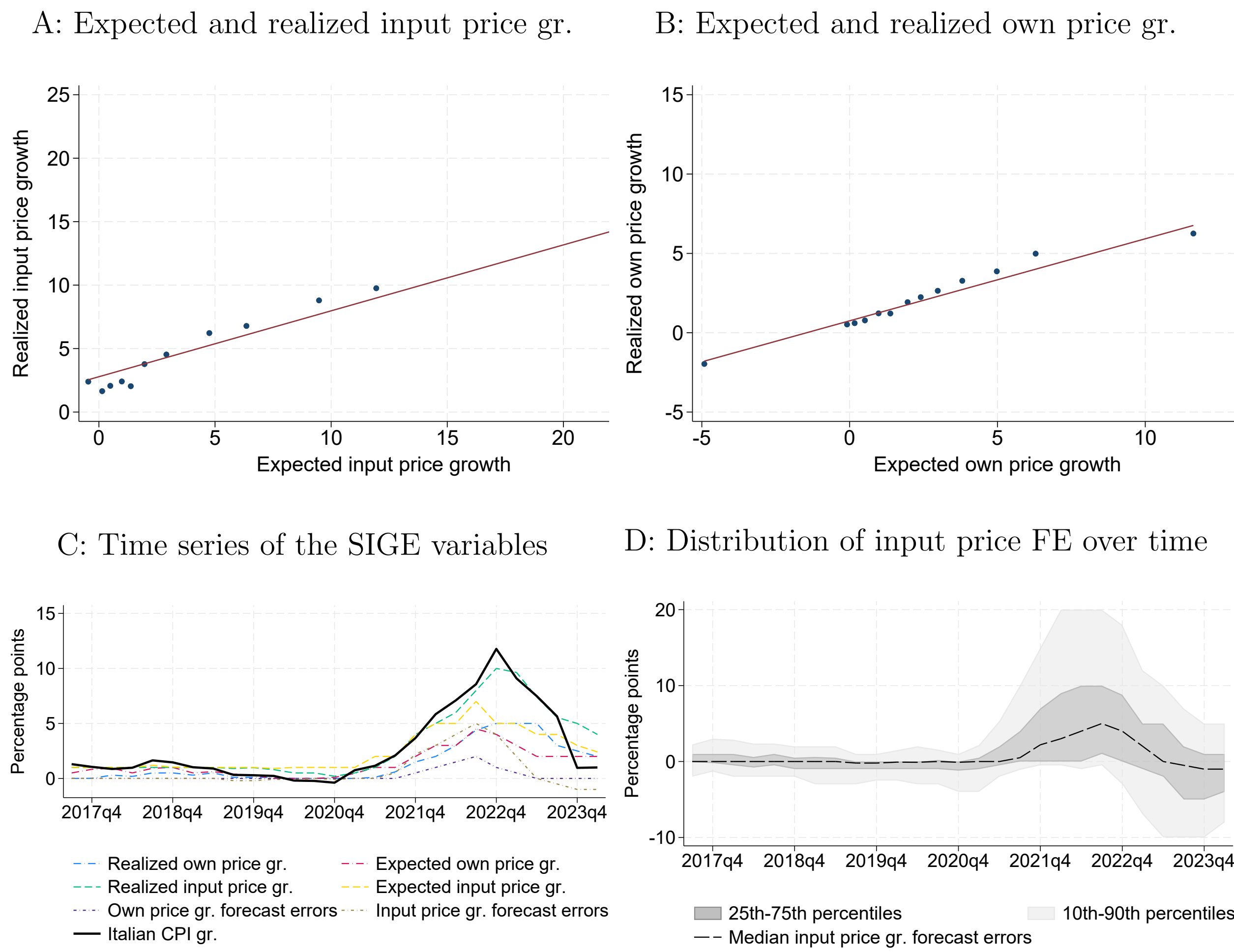
Table 8 presents descriptive statistics for the main variables of interest. There is significant heterogeneity among firms in their aggregate and own price growth expectations and decisions during the period under consideration. For example, the average expected inflation across different forecast horizons remains close to the European Central Bank's 2% target but exhibits significant dispersion. The distribution's tails are particularly wide, with 12-month-ahead expected inflation ranging from 0.4% at the 10th percentile to 6% at the 90th percentile.

Panel A of Figure 1 compares the expected input price growth for the next 12 months (x-axis) with the realised input price growth that occurred over the same period (y-axis); panel B does the same for own price growth. Both variables display a strong positive correlation between the expected and realised values, confirming that, on average, firms are highly accurate at predicting the evolution of their own input and sales prices. This strengthens

[4]To limit the role played by outliers, the variables are trimmed at the 1st and 99th percentiles for each quarter. However, using raw data yields nearly identical results.

[5]A similar approach has been recently adopted by Bachmann et al. (2021), Barrero (2022), Alati et al. (2024), Parlapiano (2024), and Bunn et al. (2025).

Figure 1: The SIGE survey




*Notes*: Panels A and B of the figure plot the relationship between expected and realised input and output price growth. Panel C shows the time series of the main variables used in the analysis. Panel D presents the distribution over time of the input price forecast errors, defined as the difference between realised and expected input price growth. The data are sourced from the SIGE for the period 2017Q3–2024Q1.

the validity of the survey data used in this analysis.

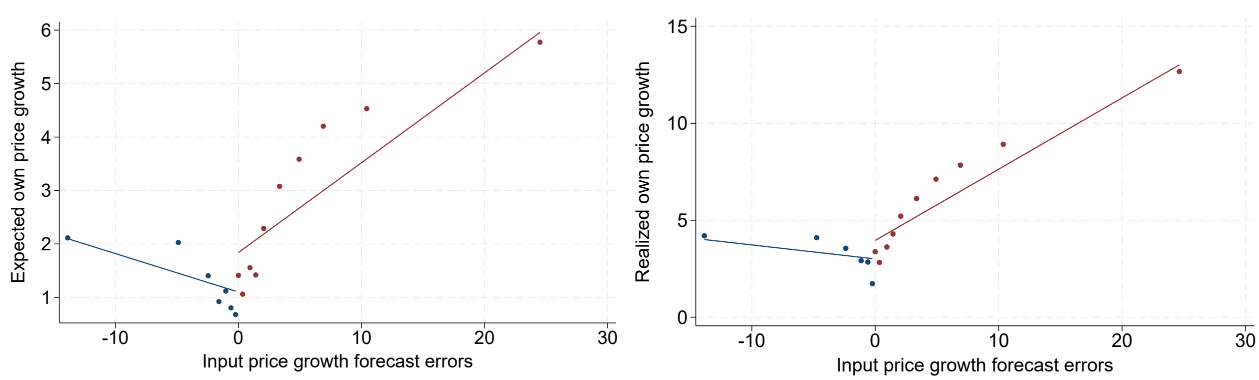
Panel C of Figure 1 shows the time series of the median values of the main variables used in the analysis, namely expected and realised input and output price growth. The figure also shows the forecast errors (FE). The expected and realised price growth series closely follow each other, indicating that firms tend to report their true expectations. The expected and realised own price variables strongly correlate with the aggregate Italian Consumer Price

Index, rising during the inflationary episode of 2022 and 2023, which further confirms the survey's high representativeness for the broader economy. Moreover, both input and output forecast errors increased during this period, suggesting that firms struggled to anticipate the future evolution of their own input and sales prices.

The time series of median input price forecast errors masks significant heterogeneity across firms. In Panel D of Figure 1, we plot different percentiles of the input price forecast errors distribution. As forecast errors are defined as the difference between realised and expected input price growth, positive values indicate that firms underestimated the increase in their own input prices relative to the actual prices they ultimately paid. In the low inflation phase, before 2022, the median forecast error was close to zero and there was limited variation in the tails, ranging from -3% to +3% at the 10th and 90th percentiles. During the inflationary episode, this interval expanded remarkably, reaching approximately -1% to +20%. As inflation returned to target, the median input price forecast errors converged back to zero, but the distribution remained quite wide in 2023 and 2024. In Section 4 we show that our results are robust to considering only the low inflation period.

Figure 2: Input price forecast errors vs expected and realized own price growth

A: Input price FE and expected price gr.    B: Input price FE and realized price gr.




*Notes*: Panels A and B of the figure plot the relationship between input price forecast errors and the expected and realised price growth. The input price forecast errors are defined as the difference between realised and expected input price growth. The data are sourced from the SIGE for the period 2017Q3–2024Q1.

Figure 2 visually anticipates the empirical results that will be presented in the next section. Panel A shows the relationship in the raw data between input price forecast errors and expected own price growth. Panel B depicts the relationship with realised price growth. Input price growth forecast errors lead to an increase in both expected and realised price growth. The effect is highly asymmetric, with mainly positive forecast errors leading to upward revisions in expectations and subsequent adjustments in the prices adopted.

## 2.2 The Company Accounts Data Service

The Company Accounts Data Service (CADS) is a proprietary database owned by Cerved Group S.p.A., a leading information provider in Italy and one of the major credit rating agencies in Europe. CADS includes detailed information on the balance sheets and income statements of nearly all Italian limited liability companies since 1993. The data is drawn from official records at the Italian Registry of Companies and from financial statements filed with the Italian Chambers of Commerce. Companies are required to submit this information on a compulsory basis, and each company's financial statement is updated annually. From this dataset, we collect yearly balance sheet data on various assets and liability items, as well as income statement information, which we use to compute measures of net profit margins, markup, and liquidity ratio.

# 3 Empirical results

In this section, we present the main results of our empirical analysis. First, we examine the pass-through from input prices to firms' own expected and realized price growth, as well as inflation expectations across different horizons. Second, we document that the magnitude of the pass-through is highly asymmetric between positive and negative input price shocks, with the former exerting the largest impact. Third, we assess whether the importance of input price shocks in shaping business-specific and aggregate expectations differs during periods of high and low inflation. Finally, we evaluate the heterogeneous effects across firms' characteristics.

To study the pass-through of input prices to firms' expectations and decisions, we estimate the following empirical specification:

$$E_t^i y_{t+j}^i = \alpha + \omega^i + \delta_t + \beta InputPriceFE_t + \theta X_t^i + \varepsilon_t^i, \tag{1}$$

where $y$ represents the expectations of firm $i$ relative to the horizon $t + j$, such as inflation or own price growth. When the dependent variable is the realized price change, we estimate the same specification using $\Delta p_{t,t+12}^i$ as the outcome, defined as the actual change in firm $i$'s own prices over the twelve months following time $t$. $InputPriceFE_t$ denotes the input price forecast errors, defined as the difference between realised input prices from $t - 12$ to $t$ and the firm's expectations at $t - 12$ for the same period. $\omega^i$ represents firm fixed effects, and $\delta_t$ captures time fixed effects. $X_t^i$ is the matrix of controls, which includes size, sector, and area controls. Standard errors are clustered at the firm level.

## 3.1 Pass-through to firms' expectations and decisions

We begin by evaluating the overall pass-through of input prices to firms' own expected and realised price growth. The results are reported in Columns 1-3 of Table 1. To facilitate the interpretation of the magnitudes, the input price forecast errors are standardised to induce a revision of 1 percentage point in the 12-month-ahead expected input price growth, as shown in Column 1.

We document a strong pass-through of input prices to firms' own prices. In response to a shock that increases expected input price growth by 1 percentage point, own expected price growth increases by 0.3 percentage points, as reported in Column 2. Moreover, 12 months later, the actual prices charged increase by almost 0.2 percentage points. The magnitude of

Table 1: Input price forecast errors and firms' price expectations and decisions

| | (1) Expected input price gr. | (2) Expected own price gr. | (3) Realized own price gr. |
|---|---|---|---|
| Input price FE | 1.000*** | 0.283*** | 0.184*** |
| | (0.0456) | (0.0281) | (0.0394) |
| Constant | 3.090*** | 1.717*** | 2.857*** |
| | (0.326) | (0.223) | (0.333) |
| Observations | 22102 | 22051 | 16067 |
| $R^2$ | 0.572 | 0.448 | 0.444 |
| Controls | YES | YES | YES |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for expected input price growth, own price growth, and realised price growth, all regressed on input price forecast errors. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

Table 2: Input price forecast errors and firms' inflation expectations

| | (1) Expected infl. (6m) | (2) Expected infl. (12m) | (3) Expected infl. (24m) | (4) Expected infl. (36-60m) |
|---|---|---|---|---|
| Input price FE | 0.0361*** | 0.0244** | 0.0138 | 0.00944 |
| | (0.0108) | (0.0109) | (0.0105) | (0.0103) |
| Constant | 2.823*** | 2.489*** | 2.207*** | 2.075*** |
| | (0.110) | (0.111) | (0.117) | (0.128) |
| Observations | 18930 | 18939 | 18937 | 18942 |
| $R^2$ | 0.807 | 0.744 | 0.652 | 0.585 |
| Controls | YES | YES | YES | YES |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for inflation expectations across different horizons regressed on input price forecast errors. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

this imperfect pass-through is consistent with empirical estimates in the literature.[6] This suggests that the propagation of cost pressures is incomplete, but the pass-through is quantitatively important for determining changes in output prices. It also implies that firms typically absorb a large part of the cost increases by lowering their profit margins.

The effects are not limited to firms' own variables. As shown by Andrade et al. (2022), firms rely on their business conditions to form expectations about the aggregate economy. In

[6]There is a substantial body of work studying and documenting incomplete pass-through using both granular and aggregate data. See, among others, Taylor (2000), Smets and Wouters (2003), Gopinath and Itskhoki (2010), Auer and Schoenle (2016), Nakamura and Zerom (2010), Garetto (2016), Riggi and Tagliabracci (2022), Amiti et al. (2019), and Dedola et al. (2021)

Table 2, we show that firms also tend to revise their expectations about aggregate inflation in response to an input price increase. Following an increase in expected input price growth of 1 percentage point, firms anticipate a rise of 0.036 percentage points in 6-month-ahead inflation (Column 1) and 0.024 percentage points in 12-month-ahead inflation (Column 2). No significant effects are found for longer-term expectations (Columns 3 and 4), suggesting that longer-term expectations remain well-anchored.

These results indicate that firms' inflation expectations are influenced by their own cost conditions, leading them to extrapolate from firm-specific developments to the broader economy, particularly in the short to medium term. This implies that during periods of rising input costs, firms may collectively contribute to inflationary pressures through upward adjustments in their expectations, potentially reinforcing inflation persistence. However, the fact that long-term expectations remain anchored indicates that firms do not view these cost shocks as fundamentally altering the long-run inflation outlook, pointing to the credibility of the central bank over the period considered.

As suggested by Figure 2, the pass-through of input price shocks appears to be asymmetric between positive and negative shocks. To formally assess this, we re-estimate our baseline specification by differentiating cost shocks according to their sign. Table 3 presents the results for firms' own variables, allowing us to examine whether upward and downward input price shocks elicit different responses in firms' pricing behavior and expectations.

While previous studies have documented nonlinear price responses to shocks—typically finding stronger reactions to cost increases than to cost declines (Peltzman, 2000; Buckle and Carlson, 2000; Benzarti et al., 2020; Bunn et al., 2025)—our results reveal an even more pronounced asymmetry. Firms primarily revise their own expected prices in response to positive input price shocks, and realised prices also respond more strongly to such shocks. The magnitude of these effects is more than twice as large for cost increases compared to decreases, in contradiction with standard New Keynesian models like Calvo pricing or menu cost models, which typically imply symmetric price adjustment. In Section 3.3, we explore

Table 3: The asymmetric pass-through of input price forecast errors

| | (1) | (2) |
|---|---|---|
| | Expected own price gr. | Realized own price gr. |
| Input price FE (+) | 0.333*** | 0.224*** |
| | (0.0444) | (0.0633) |
| Input price FE (-) | 0.187*** | 0.100** |
| | (0.0360) | (0.0503) |
| Constant | 1.642*** | 2.795*** |
| | (0.225) | (0.337) |
| Observations | 22051 | 16067 |
| $R^2$ | 0.448 | 0.444 |
| Controls | YES | YES |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for expected own price growth and realised price growth, all regressed on input price forecast errors. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

mechanisms that can account for this asymmetry. We provide evidence consistent with state-dependent pricing models by showing that firms with low net profit margins exhibit stronger pass-through to their own prices. We also document that liquidity constraints play a role in shaping asymmetric pass-through, supporting theories of financial frictions and precautionary pricing behavior (e.g., Gilchrist et al., 2017).

The same asymmetric effect is observed in firms' inflation expectations across different horizons. As shown in Table 4, firms revise their inflation expectations exclusively in response to positive input price shocks. Both short-term expectations (6- and 12-month ahead) and medium-term expectations (24-month ahead) are revised upwards, while negative shocks have no statistically significant impact on firms' aggregate inflation expectations. Meanwhile, longer-term expectations (measured as the average between 36- and 60-month ahead forecasts) remain unaffected by both positive and negative shocks, reinforcing the view that firms' long-run inflation expectations remain well-anchored notwithstanding short-term fluctuations.

Since firms revise upwards their inflation expectations in response to cost increases but do not adjust them downwards when costs decline, inflationary pressures may persist for longer

Table 4: The asymmetric pass-through of input price forecast errors to inflation expectations

| | (1) Expected infl. (6m) | (2) Expected infl. (12m) | (3) Expected infl. (24m) | (4) Expected infl. (36-60m) |
|---|---|---|---|---|
| Input price FE (+) | 0.0585*** | 0.0442*** | 0.0291** | 0.0240* |
| | (0.0151) | (0.0151) | (0.0146) | (0.0141) |
| Input price FE (-) | -0.0105 | -0.0172 | -0.0181 | -0.0209 |
| | (0.0178) | (0.0184) | (0.0174) | (0.0180) |
| Constant | 2.787*** | 2.456*** | 2.182*** | 2.051*** |
| | (0.111) | (0.112) | (0.118) | (0.130) |
| Observations | 18930 | 18939 | 18937 | 18942 |
| $R^2$ | 0.808 | 0.745 | 0.653 | 0.585 |
| Controls | YES | YES | YES | YES |

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for inflation expectations across different horizons regressed on input price forecast errors. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

periods, leading to greater inflation inertia. Such asymmetry suggests that temporary cost shocks, such as energy price spikes, could have prolonged effects on inflation expectations, making it more challenging for monetary authorities to deliver on their price stability mandate.

Finally, in Table 5, we show results on firms' economic expectations as dependent variables. The SIGE survey asks firms about their expectations for their total number of employees, business-specific conditions, and aggregate economic conditions over the next three months. These qualitative responses are coded as 1 if firms anticipate an increase, 0 if they expect no change, and -1 if they foresee a decline.

Columns 1–3 show that while expected input price increases do not significantly affect firms' employment expectations, they lead to a notable deterioration in both business-specific and aggregate economic expectations. As shown in Columns 4–6, this effect is highly asymmetric, with firms revising their economic outlook downward only in response to positive input price shocks. These findings reinforce the idea that input price forecast errors are perceived as supply-side shocks—raising costs while simultaneously worsening economic conditions. Moreover, the results highlight that firms do not view their own cost pressures in

Table 5: Input price forecast errors and firms' economic expectations

| | (1) Expected N employees (3m) | (2) Firm econ. cond. (3m) | (3) Aggregate econ. cond. (3m) | (4) Expected N employees (3m) | (5) Aggregate econ. cond. (3m) | (6) Firm econ. cond. (3m) |
|---|---|---|---|---|---|---|
| Input price FE | 0.00222 | -0.00998*** | -0.00833*** | | | |
| | (0.00186) | (0.00201) | (0.00225) | | | |
| Input price FE (+) | | | | 0.00262 | -0.0126*** | -0.0132*** |
| | | | | (0.00257) | (0.00308) | (0.00274) |
| Input price FE (-) | | | | 0.00142 | 0.000203 | -0.00361 |
| | | | | (0.00378) | (0.00408) | (0.00419) |
| Constant | 2.135*** | 1.957*** | 1.806*** | 2.134*** | 1.813*** | 1.962*** |
| | (0.0282) | (0.0347) | (0.0322) | (0.0286) | (0.0323) | (0.0345) |
| Observations | 22212 | 22194 | 21959 | 22212 | 21959 | 22194 |
| $R^2$ | 0.365 | 0.353 | 0.441 | 0.365 | 0.441 | 0.353 |
| Controls | YES | YES | YES | YES | YES | YES |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for expected number of employees, firms' and aggregate economic conditions, all regressed on input price forecast errors. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

isolation; rather, they extrapolate from their business-specific conditions to form expectations about the broader economy.

## 3.2 Micro vs macro shocks

In models of rational inattention (Sims, 2003, Reis, 2006, Bartosz and Wiederholt, 2009, Afrouzi, 2016), agents face limited cognitive resources and optimally decide how to allocate attention, focusing only on the most relevant information and ignoring less critical aspects. As such, in periods of high inflation, agents are expected to allocate more attention to aggregate variables rather than to firm-specific factors.

We test the predictions of rational inattention models by examining the pass-through of input prices in periods of low versus high inflation, while controlling for aggregate shocks. We divide the sample into two distinct periods: low inflation (2017Q3–2021Q4) and high inflation (2022Q1–2023Q3).

To measure aggregate shocks, we use year-on-year CPI news surprises, which represent the difference between the actual CPI and the forecast value prior to its release, obtained

Table 6: The pass-through in periods of low and high inflation

| | (1) Expected input price gr. Low inflation | (2) Expected input price gr. High inflation | (3) Expected own price gr. Low inflation | (4) Expected own price gr. High inflation | (5) Realized own price gr. Low inflation- | (6) Realized own price gr. High inflation |
|---|---|---|---|---|---|---|
| Input price FE | 1.176*** | 1.109*** | 0.426*** | 0.313*** | 0.287 | 0.208* |
| | (0.200) | (0.0916) | (0.0600) | (0.0584) | (0.244) | (0.0967) |
| Yoy CPI news surprise | -0.196 | 0.662*** | -0.139 | 0.427*** | -0.322 | 0.744** |
| | (0.184) | (0.147) | (0.112) | (0.102) | (0.462) | (0.242) |
| Constant | 1.875*** | 4.752*** | 1.023*** | 2.477*** | 1.099* | 2.309*** |
| | (0.289) | (0.387) | (0.279) | (0.365) | (0.595) | (0.665) |
| Observations | 11764 | 9629 | 11720 | 9628 | 8435 | 7439 |
| $R^2$ | 0.500 | 0.587 | 0.435 | 0.465 | 0.362 | 0.457 |
| Controls | YES | YES | YES | YES | YES | YES |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for expected input price growth, own price growth, and realised price growth, all regressed on input price forecast errors. The input price forecast errors are defined as the difference between realised and expected input price growth. As a measure of aggregate shocks, we use the year-on-year (YoY) CPI news surprises, defined as the difference between the actual CPI and the experts' forecast prior to the release, as provided by Consensus Economics. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

from Consensus Economics. Similar to firm-level input price forecast errors, CPI surprises capture the unexpected and exogenous changes in the broader economic environment. Studies by Hamilton et al., Boehm and Kroner (2023), Bauer et al. (2024), and Di Pace et al. (2024) have explored the effects of macroeconomic data releases on financial and aggregate variables. Since these forecasts are typically accurate and timely, the forecast errors can be viewed as exogenous shocks, providing an insightful measure of unexpected shifts in economic conditions. The surprise series is standardised to induce a 1 percentage point increase in the Italian CPI on impact.[7]

The results for firms' own price variables are reported in Table 6. In the first two columns, we present the effects of a FE in input prices on expectations of input price growth for the two subsamples, while controlling for aggregate surprises. The magnitude of the pass-through is similar across both the high and low inflation periods. However, consistent with predictions from rational inattention models, macroeconomic shocks—measured using the year-on-year CPI news surprises—emerge as important drivers of firms' inflation expectations only during periods of high inflation. This pattern holds for both expected own price growth (Columns 3

[7]The response of the Italian CPI to an inflation surprise is reported in Figure 7 in the appendix.

Table 7: The pass-through to inflation expectations in periods of low and high inflation

| | (1)<br>Expected infl. (6m)<br>Low inflation | (2)<br>Expected infl. (6m)<br>High inflation | (3)<br>Expected infl. (12m)<br>Low inflation | (4)<br>Expected infl. (12m)<br>High inflation | (5)<br>Expected infl. (24m)<br>Low inflation | (6)<br>Expected infl. (24m)<br>High inflation |
|---|---|---|---|---|---|---|
| Input price FE | 0.0417 | 0.0400 | 0.0409** | 0.0295 | 0.0335* | 0.0202 |
| | (0.0272) | (0.0462) | (0.0182) | (0.0345) | (0.0165) | (0.0259) |
| Yoy CPI news surprise | -0.134 | 0.855** | -0.0993 | 0.643** | -0.0644 | 0.512** |
| | (0.111) | (0.314) | (0.0957) | (0.231) | (0.0813) | (0.184) |
| Constant | 1.172*** | 4.795*** | 1.238*** | 3.992*** | 1.394*** | 3.445*** |
| | (0.113) | (0.506) | (0.105) | (0.403) | (0.104) | (0.359) |
| Observations | 10158 | 8205 | 10150 | 8203 | 10151 | 8214 |
| $R^2$ | 0.320 | 0.424 | 0.394 | 0.460 | 0.444 | 0.485 |
| Controls | YES | YES | YES | YES | YES | YES |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for inflation expectations across different horizons regressed on input price forecast errors. The input price forecast errors are defined as the difference between realised and expected input price growth. As a measure of aggregate shocks, we use the year-on-year (YoY) CPI news surprises, defined as the difference between the actual CPI and the experts' forecast prior to the release, as provided by Consensus Economics. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

and 4) and realised own price growth (Columns 5 and 6). These findings align with those of Born et al. (2025), who, using data from Italian and German firms, document that in period of low inflation expectations overreact to micro news but underreact to macro news.

The determinants of firms' aggregate expectations also differ between low and high inflation periods. As shown in Table 7, in periods of low inflation, firms primarily rely on their own business conditions to form inflation expectations, with their expectations being influenced by their own input price forecast errors rather than aggregate inflation surprises (Columns 3 and 5). In contrast, during periods of high inflation, macroeconomic shocks dominate, and only aggregate shocks affect firms' inflation expectations (Columns 2, 4, and 6).

As an alternative measure of aggregate shocks, similar to Born et al. (2025), we use firms' forecast errors for 12-month-ahead expected inflation. This variable is defined analogously to input price forecast errors, i.e., as the difference between realized and expected inflation growth. Table 9 in the Appendix presents the results for inflation expectations across different horizons. Consistently, during periods of low inflation, aggregate shocks have no impact on firms' inflation expectations, which instead respond primarily to firm-specific shocks.

However, in periods of high inflation, aggregate shocks become the dominant driver.

The evidence suggests that when inflation is high, firms are more responsive to macroeconomic signals, particularly aggregate shocks such as CPI news surprises, when adjusting their expectations for input prices and their own prices. This highlights the importance for policymakers to effectively communicate their expectations about macroeconomic conditions, especially during inflationary episodes, as firms are likely to adjust their behavior based on the information they receive about the broader economy. In contrast, during periods of low inflation, firms rely more on business-specific information when forming expectations, implying that aggregate policy signals may have less immediate effect on their price-setting behavior.

### 3.3 Heterogeneity across firms' characteristics

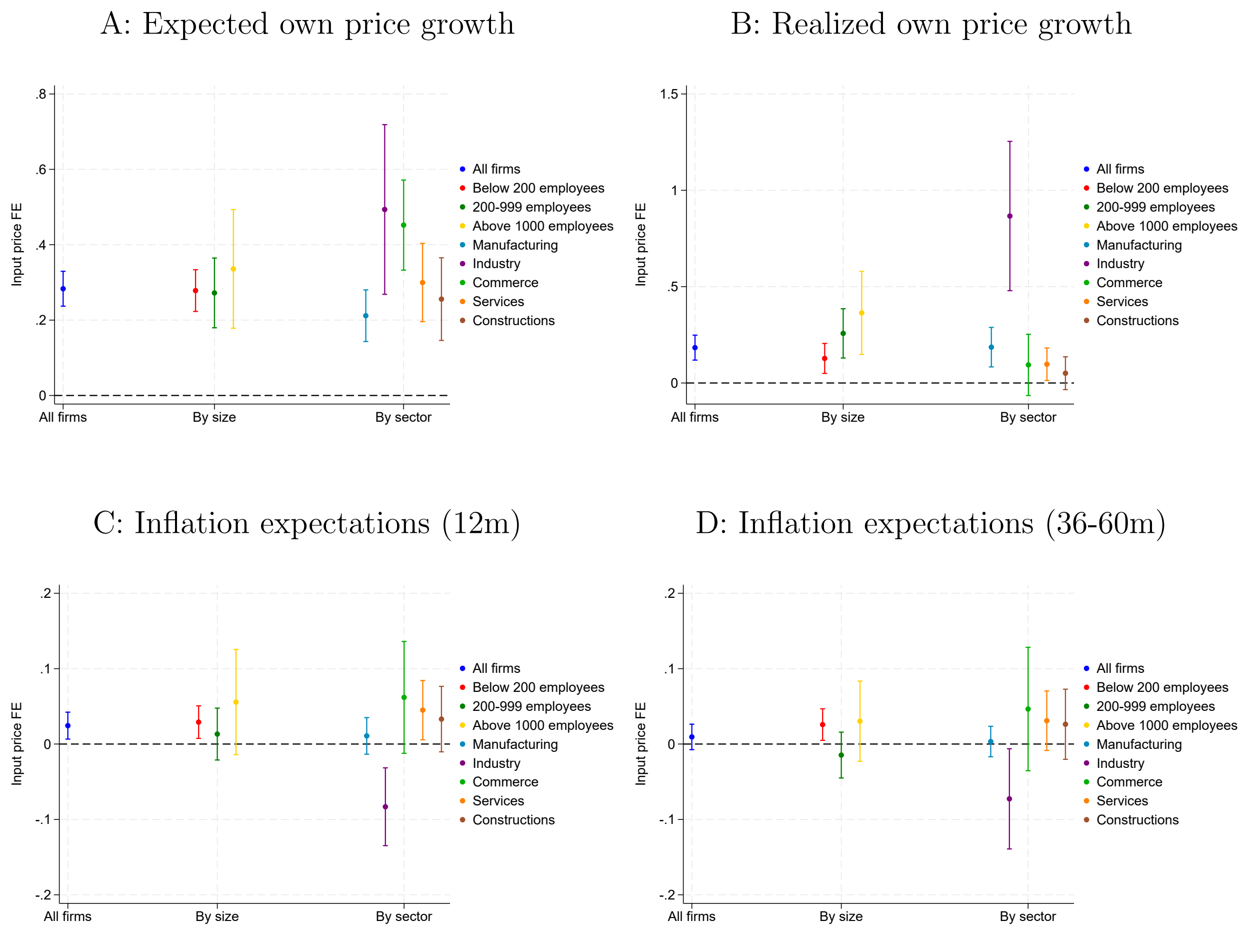
The effects documented so far may conceal significant heterogeneity across firms with different characteristics. In this section, we examine how firm-specific factors influence the pass-through of input prices to firms' expectations and decisions.

We begin by assessing whether the magnitude of the pass-through varies by firm size and sector. We categorize firms into three groups: those with fewer than 200 employees, those with 200 to 999 employees, and those with 1,000 or more employees. Additionally, we analyze sectoral differences by distinguishing firms operating in manufacturing, industry, commerce, services, and construction.

Figure 3 illustrates the impact of input price forecast errors on expected and realised own price growth (Panels A and B), as well as 12-month-ahead inflation expectations (Panel C) and the average expected inflation for the 36-60 month horizon (Panel D). For comparison, the blue dot and confidence bands represent the effects previously documented for the full sample.

Our analysis reveals that the pass-through to expected and realised own price growth is largely homogeneous across firm size groups. However, the pass-through to both short-

Figure 3: The pass-through of input price forecast errors across firms' characteristics




*Notes*: The figure presents regression results for expected and realised own price growth, as well as inflation expectations across different horizons, in relation to input price forecast errors across firms' characteristics. Input price forecast errors are defined as the difference between realised and expected input price growth. The shaded bands represent 90% confidence intervals. Additional controls are included (discussed in the main text but not shown). The analysis is based on SIGE data covering the period from 2017Q3 to 2024Q1.

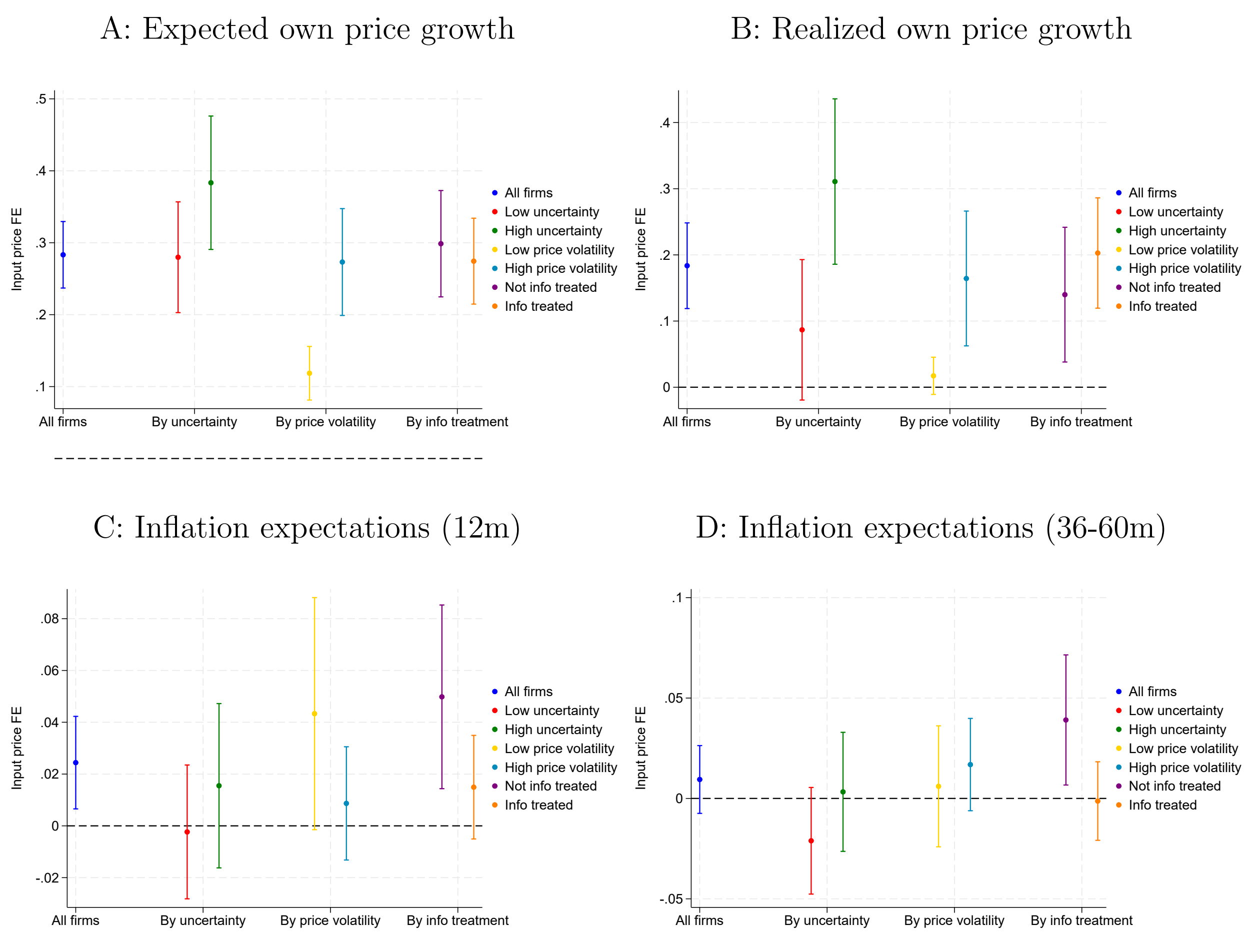
and medium-to-long-term inflation expectations is significant only for smaller firms. This suggests that inflation expectations for smaller firms are more heavily influenced by firm-specific conditions and are more prone to de-anchoring in response to increases in input prices.

Turning to sectoral heterogeneity, we find that the strongest pass-through to realised prices occurs in the industrial and manufacturing sectors. This aligns with the findings of Gödl-Hanisch and Menkhoff (2024), who, using data from the Ifo Institute's business survey, report the lowest pass-through for services firms and the highest for manufacturing firms. As manufacturing and industrial firms are typically more dependent on raw materials and intermediate goods, their final prices are more sensitive to fluctuations in input prices. However, this heightened sensitivity does not extend to inflation expectations, where sectoral differences in pass-through are less pronounced.

As the SIGE survey is merged with the universe of firms' balance sheet data, we gain access to detailed sectoral classifications. Using firms' ATECO codes—the Italian classification system for economic activities, which closely corresponds to the European NACE codes—we classify firms along two main dimensions: their position in the supply chain and the intensity of their input costs. Firms are grouped as upstream, midstream, or downstream depending on their proximity to the final consumer. Upstream sectors include extractive activities and heavy manufacturing, midstream sectors are involved in processing and the production of capital goods, while downstream sectors consist mainly of retail, services, and other consumer-facing industries. We further classify firms based on the dominant input in their production process, distinguishing between energy-intensive sectors such as heavy manufacturing, labor-intensive sectors like food and beverage services, and capital-intensive sectors such as the manufacture of motor vehicles and machinery.

The results of this classification are presented in Figure 8 in the Appendix. As expected, the degree of input price pass-through declines as we move closer to the final consumer. Firms in upstream sectors exhibit a pass-through of approximately 0.3 percentage points, while for downstream firms, the magnitude is significantly lower, at less than 0.1 percentage points. In addition, pass-through is markedly higher in energy- and capital-intensive sectors compared to labor-intensive ones. These findings suggest that both a firm's position in the supply chain and the nature of its production inputs are key determinants of its pricing behavior. Understanding this heterogeneity is crucial for assessing how cost shocks propagate through the economy and how inflationary pressures may vary across industries.

Figure 4: The pass-through of input price forecast errors across firms' characteristics




*Notes*: The figure presents regression results for expected and realised own price growth, as well as inflation expectations across different horizons, in relation to input price forecast errors by firm characteristics. Input price forecast errors are defined as the difference between realised and expected input price growth. Shaded bands represent 90% confidence intervals. Additional controls are included (discussed in the main text but not shown). The analysis is based on SIGE data from 2017Q3 to 2024Q1.

We next explore the role of other firms' characteristics like the degree of uncertainty regarding future business conditions and the volatility of price growth. The results are presented in Figure 4.

Uncertainty can have ambiguous effects on firms' pricing decisions. On one hand, greater uncertainty may lead to larger shocks, which in turn could result in more flexible pricing in the presence of menu costs (Barro, 1972). On the other hand, heightened uncertainty might induce a "wait-and-see" strategy, with firms opting to delay further price adjustments (Vavra, 2014). Supporting evidence for the first channel is provided by Bachmann et al. (2019), Arndt and Enders (2023), and Gödl-Hanisch and Menkhoff (2024), who show that higher volatility over time is associated with increased price pass-through.

To measure uncertainty at the firm level, we rely on survey responses from the SIGE dataset. Firms report the probability that their business conditions in the next three months will be better, the same, or worse. We quantify uncertainty as $1 - \sum_{i=1}^{3}(Prob_i - \frac{1}{3})^2$, where $Prob_i$ represents the probability assigned to each of the three possible outcomes. The lowest uncertainty occurs when all probability mass is assigned to a single scenario (e.g., 100% probability of better conditions), while higher uncertainty is associated with more evenly distributed probabilities (i.e., 33% for each scenario). We categorise firms into high and low price uncertainty, based on whether their reported uncertainty falls within the top or bottom third of the distribution for each quarter.

We find that firms with higher levels of idiosyncratic uncertainty exhibit a significantly greater pass-through of input prices to actual price growth. The magnitude of this effect is substantial: firms with high uncertainty experience a pass-through three times larger than firms with low uncertainty. However, we find no significant differences in the way these firms extrapolate uncertainty to expected inflation.

We next examine the relationship between the magnitude of pass-through and the frequency of price changes. To measure price volatility at the firm level, we calculate the standard deviation of price growth changes implemented by the firms. We then categorise firms into high and low price volatility groups based on whether their reported value falls within the top or bottom third of the distribution for each quarter.

Consistent with Gödl-Hanisch and Menkhoff (2024), we find that a higher frequency of past price changes is associated with a higher pass-through. Firms that adjust their prices more frequently are more likely to coordinate their pricing strategies to maintain competitiveness. This implicit coordination enhances the pass-through of input price increases, as firms not only adjust their prices to reflect their own cost pressures but also to prevent losing market share to their competitors. The concept of price coordination is particularly salient in markets where firms frequently adjust their prices and are highly responsive to competitors' pricing decisions.

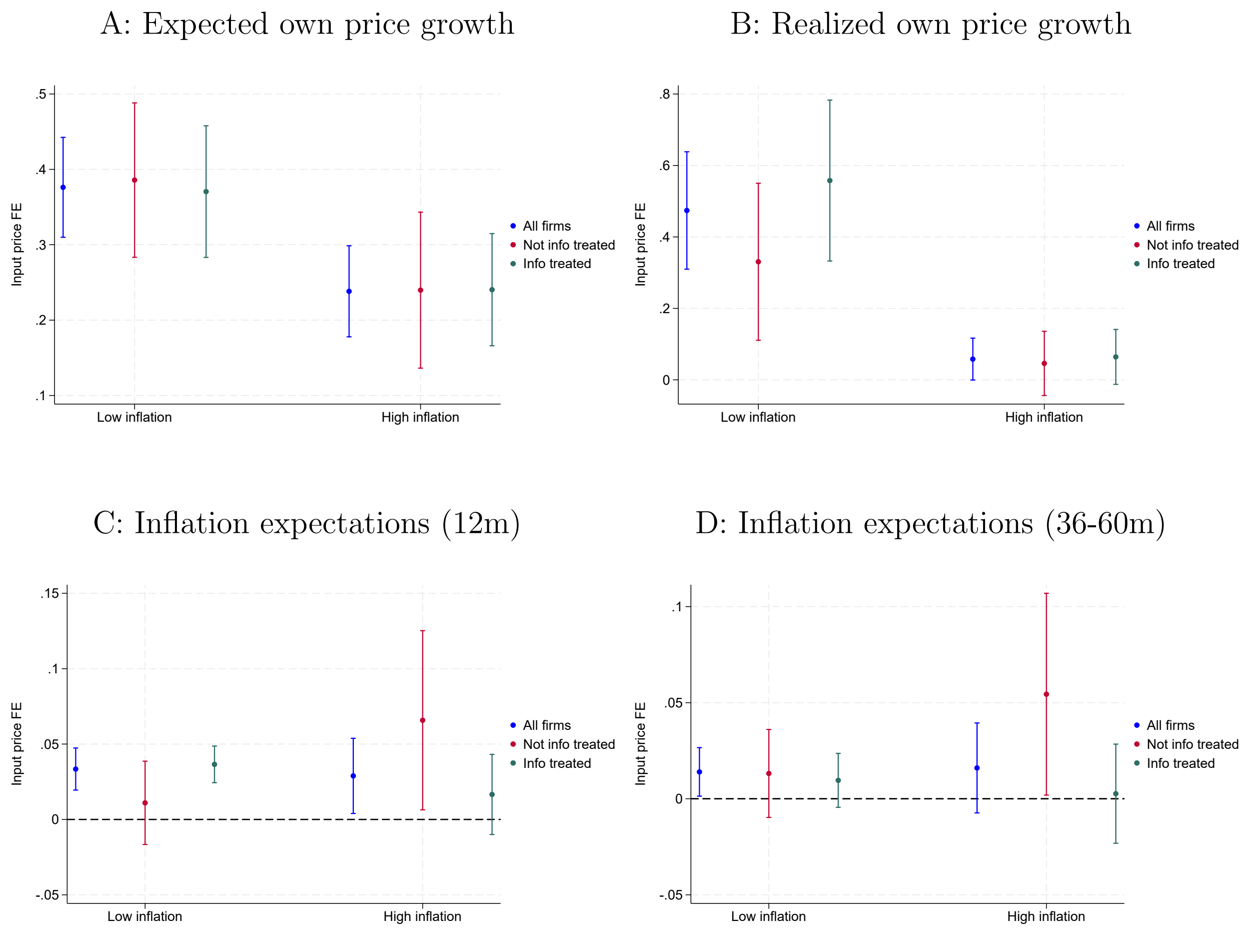
In Figure 4, we also assess the causal impact of providing firms with information about recently realized inflation on the magnitude of the pass-through from input prices to their expectations. Firms in the SIGE are randomly assigned to one of two groups at irregular intervals. The first group is asked to report their inflation expectations for the next 12 months without receiving additional information. The second group receives the same question but only after being informed about the most recent inflation rates for Italy and the euro area. Firms remain in their assigned groups until the next reshuffling, ensuring that some firms consistently receive updated information while others do not. Prior to 2012Q3, all firms received identical information about recent inflation rates. Starting in 2012Q3, approximately one-third of firms were randomly assigned to the group that did not receive any information. Firms were reshuffled again in 2012Q4, and they remained in their new assignments until 2017Q2, when another reshuffling occurred, followed by a final reassignment in 2019Q4. The unique extended duration of this treatment makes the SIGE an ideal setting to examine how providing firms with information on actual inflation influences their expectations and decision-making.[8] As shown in Figure 9 of the Appendix, this treatment significantly improves the alignment of treated firms' inflation expectations with actual inflation.

As noted by Rosolia (2024), providing firms with information on the current inflation level does not affect their expected and realised own price growth, and the pass-through to these variables remains comparable across groups. However, our analysis offers novel insights. First, we document that firms receiving inflation information exhibit a significantly lower pass-through to both their short- and long-term inflation expectations. This finding suggests that clear and transparent communication about the state of the economy can effectively

[8]See Coibion et al. (2020), Bottone et al. (2021), Ropele et al. (2022), and Ropele et al. (2024).

reduce the extrapolation of business-specific conditions to broader aggregate expectations, thus limiting potential second-round effects.

Figure 5: The pass-through to information treated firms




*Notes*: The figure presents regression results for expected and realised own price growth, as well as inflation expectations across different horizons, based on input price forecast errors for firms that received the information treatment and those that did not. Input price forecast errors are defined as the difference between realised and expected input price growth. Shaded bands represent 90% confidence intervals. Additional controls are included (discussed in the main text but not shown). The analysis is based on SIGE data from 2017Q3 to 2024Q1.

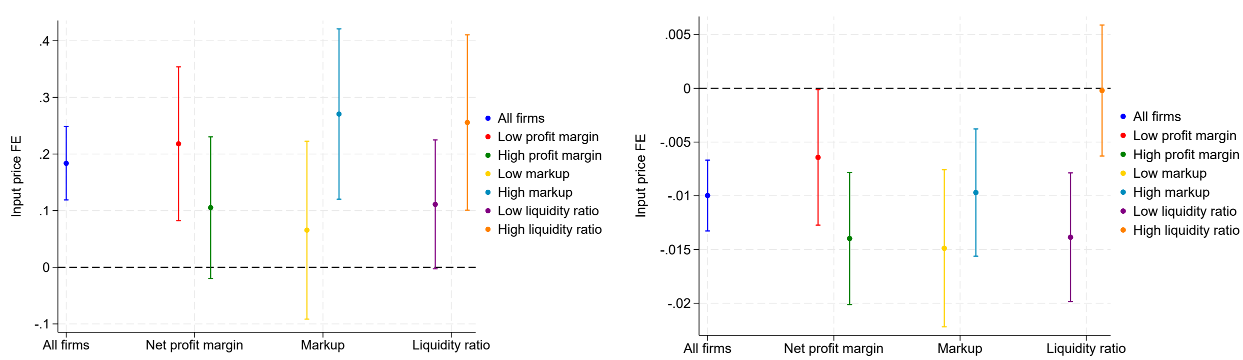
Second, we show that the effects of providing firms with inflation information differ in periods of low and high inflation. Figure 5 presents the coefficients for treated and non-treated firms across two subperiods. While the treatment does not significantly affect firms' expected or realised own price growth in either period, the pass-through to firms' inflation expectations is more muted for treated firms, particularly in high inflation periods, as shown in Panels C and D.

These findings underscore the potential of information-based policy tools to stabilise inflation expectations and manage inflation dynamics, ultimately enhancing the effectiveness of monetary policy and mitigating the risk of inflation spirals. Well-informed firms are better equipped to anchor their expectations, filtering out short-term price fluctuations and focusing on broader economic trends. In high inflation periods, firms are more likely to rely on aggregate economic information rather than reacting impulsively to idiosyncratic cost increases. This anchoring effect can contribute to a more stable inflation environment, as firms are less prone to mechanically passing on input price increases, thereby reducing the risk of inflationary spirals. By providing clear and reliable information on inflation trends, central banks can steer firms' expectations, diminish the mechanical pass-through of input price increases to final prices, and reduce the likelihood of transitioning to a high-inflation regime.

Figure 6: The pass-through of input price forecast errors across firms' characteristics

A: Realised own price growth

B: Firms' expected business condition




*Notes*: The figure presents regression results for own price growth and expected business conditions in relation to input price forecast errors by firm characteristics. Input price forecast errors are defined as the difference between realised and expected input price growth. Shaded bands represent 90% confidence intervals. Additional controls are included (discussed in the main text but not shown). The analysis is based on SIGE data from 2017Q3 to 2024Q1.

We conclude by evaluating the role in the transmission of input to output prices of three additional characteristics derived from firms' balance sheet data, namely the net profit margin, the markup, and the liquidity ratio.

We define the net profit margin as the percentage of revenue that remains as profit after accounting for all costs and taxes. It is commonly used as a proxy for a firm's profitability and reflects its capacity to absorb cost shocks without needing to adjust prices. The markup is calculated as the difference between value-added and labor costs, relative to value-added. This metric captures a firm's pricing power relative to its production costs and is often interpreted as an indicator of market power and the level of competition in its operating environment (Coibion et al., 2018, Kharroubi and Maurin, 2023). Finally, the liquidity ratio measures a firm's ability to meet short-term obligations using liquid assets. We compute it as the sum of cash, cash equivalents, and short-term financial assets divided by total short-term liabilities. To mitigate endogeneity concerns, we use lagged values of these financial variables. For each of these variables, we then classify firms as high or low value based on whether their reported values belong to the top or bottom third of the distribution for each quarter.

The results are presented in Figure 6. The left panel displays the pass-through to realized price growth, while the right panel shows the pass-through to firms' expectations about future business conditions. Panel A reveals that firms with lower profit margins and higher markups experience a significantly stronger pass-through of input price shocks. In particular, the magnitude of the pass-through is nearly three times larger for firms with high markups compared to those with low markups. This pattern likely reflects that firms with thinner profit buffers find it more difficult to absorb input cost increases without adjusting their prices, whereas firms with higher margins enjoy greater pricing power, allowing them to raise prices without substantial demand loss.

These findings are consistent with the predictions of state-dependent pricing models (e.g., Dotsey et al., 1999; Golosov and Lucas, 2007), which emphasize that firms are more likely to adjust prices when the benefits of doing so exceed adjustment costs. For low-margin firms, even small input cost increases may trigger price changes to avoid eroding profits, while high-margin firms can afford to wait, leading to heterogeneous responses across the distribution of profitability and market power. This mechanism also aligns with the evidence in Hensel et al. (2024), who finds that firms in more competitive markets—typically associated with lower markups—exhibit weaker pass-through of energy cost shocks to both price expectations and actual prices. Together, these results underscore the importance of cost absorption capacity and market power in shaping price-setting behavior and are suggestive of state-dependent rather than time-dependent price adjustment.

We then examine how firms' liquidity and leverage conditions shape the transmission of input price shocks. Building on the findings of Gilchrist et al. (2017), who document that liquidity-constrained firms increased prices during the 2008 financial crisis—while more financially flexible firms reduced prices and expanded sales—we explore whether similar mechanisms are at play in our data. Their results suggest that financially constrained firms may prioritize preserving internal liquidity over maintaining market share, leading to higher prices even in downturns. This behavior contrasts with the predictions of standard New Keynesian models, where prices are expected to adjust symmetrically to shocks. Instead, it reflects precautionary pricing behavior driven by firms' reluctance to rely on costly or inaccessible external financing.

To test the importance of liquidity constraints in our data, we assess whether the pass-through of input price shocks to output prices differs across liquidity ratios. Panel A of Figure 6 shows that low-liquidity firms exhibit lower pass-through of input price shocks to output prices, while Panel B indicates that liquidity-constrained firms significantly worsen their expectations about their future business conditions. These findings align with Gilchrist et al. (2017), suggesting that for firms with already tight liquidity, a loss in sales could further amplify financial distress. As a result, these firms absorb a portion of cost increases to maintain cash flow and market presence, even at the expense of short-term profitability.

As liquidity concerns mount, these firms prioritise short-term cash flow over long-term profit margins, passing cost increases onto output prices despite the risk of reduced demand. This suggests that financially constrained firms view price adjustments as a liquidity management tool, reinforcing the link between financial conditions and inflation dynamics. Our findings highlight that firms' financial conditions and market structure significantly influence inflation dynamics.

# 4 Robustness

In this section, we conduct several robustness checks to further validate our main findings. First, we assess the persistence of the documented effects over time. Second, we address potential endogeneity in input price forecast errors by regressing them on firm-level controls and using the residuals as exogenous variations in input prices. Third, we estimate a range of alternative model specifications, incorporating different fixed effects, standard error adjustments, time periods, and trimming procedures.

To evaluate the persistence of the effects, Tables 10 and 11 present the estimated coefficients for the expected own price growth as well as the 6 and 12-month-ahead expected inflation. The dependent variable is shifted forward by up to three quarters to capture dynamic effects. As observed, the impact of input price surprises dissipates after two to three quarters.

Next, we examine whether further refining input price forecast errors to mitigate potential endogeneity affects our results. We do so by regressing forecast errors on firm size, geographic area, and sector while also including date and firm fixed effects. The residuals from this regression are then used in the baseline specification instead of the raw forecast errors. The results, reported in Table 13, show that the estimated coefficients remain consistent in both sign and magnitude, confirming that our findings are robust to this adjustment.

We re-estimate the baseline analysis under a range of alternative specifications. Table 14 reports the results using expected price growth as the dependent variable. Column 1 includes firm and time-by-sector fixed effects, Column 2 clusters standard errors at the firm and time-by-sector level, Column 3 adds lagged input price forecast errors as additional controls, Column 4 restricts the sample to the pre-COVID period, and Columns 5 and 6 apply more aggressive trimming procedures to limit the influence of outliers. None of these alternative specifications alters our main conclusion: input price forecast errors systematically translate into firms' own price expectations.

Finally, in Table 15, we demonstrate that our findings on the asymmetric pass-through of input prices to firms' expectations are not driven by the high-inflation period. To test this, we restrict the sample to observations up until 2021Q4, before the inflation surge. Even in this subsample, the magnitude of the pass-through from positive input price forecast errors to firms' realized price growth remains significantly higher than that of negative forecast errors. Similarly, in line with our baseline results, firms' inflation expectations respond only to positive forecast errors, confirming that the high-inflation period does not drive our results.

# 5 Conclusion

The transmission of input price shocks to firms' expectations and pricing decisions plays a crucial role in shaping inflation dynamics, particularly during periods of heightened inflationary pressures and supply chain disruptions. Understanding the magnitude and asymmetry of this pass-through is essential for designing effective monetary policy responses. Moreover, the extent to which firms adjust their expectations based on input cost changes—and how this response varies with macroeconomic conditions or firm characteristics—raises important questions for policymakers. Given the limited empirical evidence on these issues, our study contributes to filling this gap by providing causal evidence on how input price shocks influence firms' inflation expectations and pricing behavior.

Our results provide robust evidence of a strong pass-through from input prices to both firms' expectations and realized pricing decisions. Unexpected increases in input costs lead firms to revise their own price expectations upward and adjust actual prices accordingly. These shocks also influence short-term aggregate inflation expectations, although long-term expectations remain largely anchored. Crucially, we uncover a pronounced asymmetry: while firms respond forcefully to positive input price shocks, they show limited or no reaction to negative ones. This asymmetry suggests inflationary pressures may persist even after supply-side shocks ease, complicating the task of inflation stabilization.

Importantly, the strength of the pass-through depends on macroeconomic conditions and firm-specific characteristics. In high-inflation environments, firms place greater weight on aggregate signals when forming expectations. Moreover, firms with lower profit margins or greater liquidity constraints exhibit stronger pass-through, consistent with state-dependent pricing models and precautionary pricing behavior. Firms with higher markups, meanwhile, more easily pass on cost shocks, highlighting the role of market power in price-setting.

These findings carry several important policy implications. First, monetary policy should account for sectoral heterogeneity in pricing power, as inflationary pressures may be driven disproportionately by high-markup firms. At the same time, liquidity-constrained firms may delay pass-through, causing inflationary effects to emerge with a lag. Financial policies that improve firms' access to liquidity can help stabilize inflation dynamics by reducing the incentive to accelerate or suppress price adjustments based on short-term cash flow concerns. Likewise, competition policy can play a role in moderating inflation by curbing excessive market power and limiting firms' ability to pass through cost shocks unchecked.

In addition, our findings emphasize the importance of central bank communication. We show that providing firms with clear and timely information—especially about current inflation—can significantly dampen the pass-through of input price shocks to expectations. This underscores the value of transparent, proactive communication as a complement to conventional monetary tools, particularly in high-inflation periods when anchoring expectations is most urgent.

Overall, these results point to the need for differentiated policy strategies depending on the inflationary environment. During episodes of high inflation, a combination of clear communication and broad-based stabilization measures is essential. In contrast, when inflation is low and stable, more targeted interventions, such as sector-specific policies, may be more effective in shaping firms' expectations and pricing behavior. By fostering transparency and recognizing firm-level heterogeneity, policymakers can support more stable inflation dynamics and ensure smoother economic adjustments in response to both shocks and policy changes.

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Table 8: Summary statistics

| | Obs. | Mean | p10 | p50 | p90 | St. Dev. |
|---|---|---|---|---|---|---|
| Expected input price gr. | 25710 | 3.54 | 0.00 | 2.00 | 10.00 | 5.35 |
| Expected own price gr. | 25670 | 2.13 | 0.00 | 1.00 | 5.00 | 3.88 |
| Realized own price gr. | 16361 | 2.68 | 0.00 | 1.00 | 8.20 | 5.39 |
| Expected infl. (6m) | 21983 | 2.70 | 0.30 | 1.50 | 7.00 | 2.83 |
| Expected infl. (12m) | 21975 | 2.51 | 0.40 | 1.50 | 6.00 | 2.49 |
| Expected infl. (24m) | 21978 | 2.31 | 0.50 | 1.80 | 5.00 | 2.15 |
| Expected infl. (36-60m) | 21986 | 2.22 | 0.50 | 1.90 | 5.00 | 1.96 |
| Input price FE | 25935 | 1.07 | -5.00 | 0.00 | 7.80 | 7.60 |

*Notes*: The table reports several summary statistics for the expected input price growth, own price growth, realised price growth, expected inflation rate across different horizons and the input price forecast errors. The analysis is based on data from the SIGE for the period 2017Q3–2024Q1.

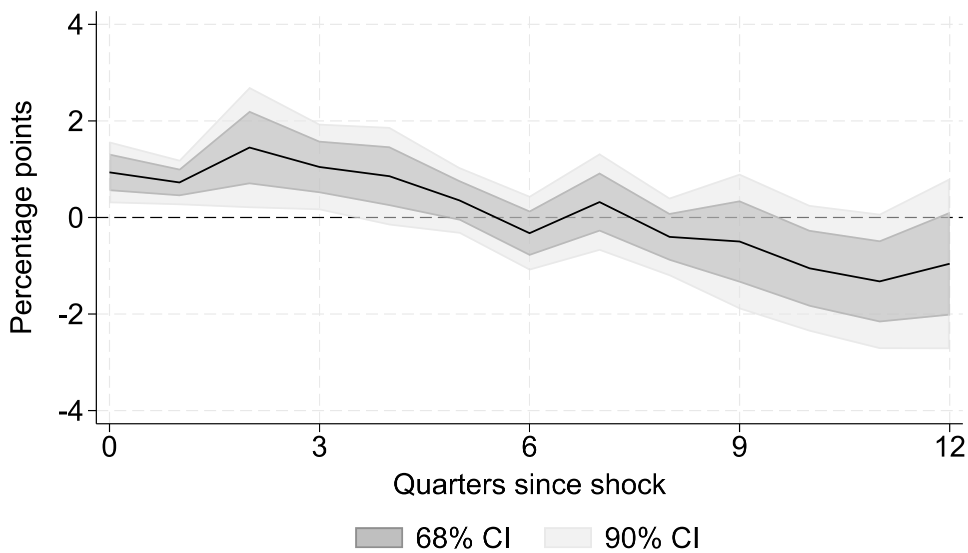
Table 9: The pass-through to inflation expectations in periods of low and high inflation

| | (1) Expected infl. (6m) Low inflation | (2) Expected infl. (6m) High inflation | (3) Expected infl. (12m) Low inflation | (4) Expected infl. (12m) High inflation | (5) Expected infl. (24m) Low inflation | (6) Expected infl. (24m) High inflation |
|---|---|---|---|---|---|---|
| Input price FE | 0.0303** | -0.0414 | 0.0246** | -0.0315 | 0.0152 | -0.0272 |
| | (0.0142) | (0.0297) | (0.0102) | (0.0199) | (0.00911) | (0.0156) |
| Inflation FE | -0.0418 | 0.297*** | -0.0210 | 0.226*** | -0.0138 | 0.179*** |
| | (0.0291) | (0.0510) | (0.0253) | (0.0351) | (0.0222) | (0.0271) |
| Constant | 1.266*** | 4.386*** | 1.333*** | 3.651*** | 1.429*** | 3.190*** |
| | (0.0930) | (0.388) | (0.0917) | (0.312) | (0.0947) | (0.283) |
| Observations | 12557 | 8101 | 12557 | 8099 | 12555 | 8108 |
| $R^2$ | 0.373 | 0.535 | 0.425 | 0.541 | 0.459 | 0.539 |
| Controls | YES | YES | YES | YES | YES | YES |

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for inflation expectations across different horizons regressed on forecast errors on input price and the 12-month ahead expected inflation. The forecast errors are defined as the difference between realised and expected growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

Figure 7: Italian CPI response to inflation surprises




*Notes*: This figure shows the response of the Italian Consumer Price Index to an inflation surprise. The inflation surprises is taken from Consensus Economics and defined as the difference between the analysts' forecasted values and the actual release.

Table 10: Input price forecast errors and firms' expected price expectations, persistency

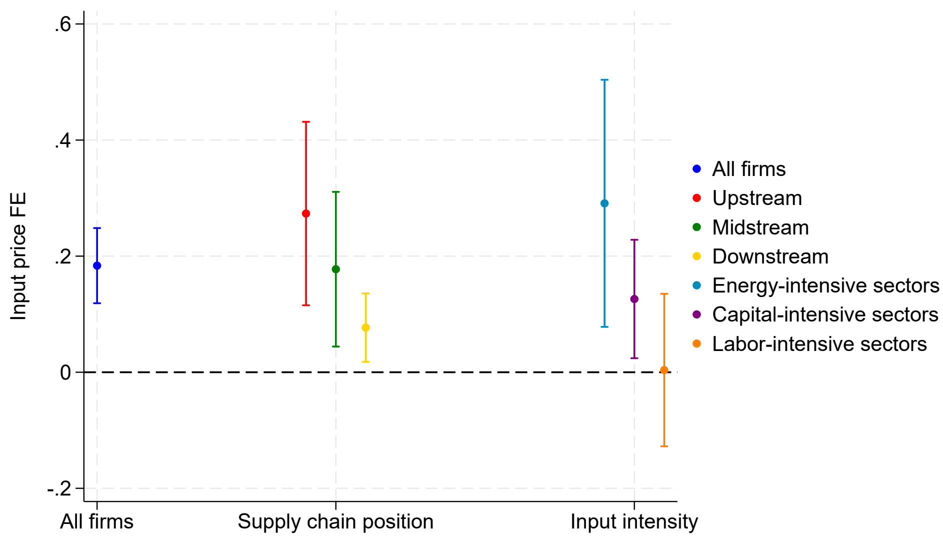
| | (1)<br>Expected own price gr. | (2)<br>F.Expected own price gr. | (3)<br>F2.Expected own price gr. | (4)<br>F3.Expected own price gr. |
|---|---|---|---|---|
| Input price FE | 0.283*** | 0.147*** | 0.0994*** | 0.00728 |
| | (0.0281) | (0.0259) | (0.0324) | (0.0331) |
| Constant | 1.717*** | 1.826*** | 1.534*** | 1.847*** |
| | (0.223) | (0.252) | (0.223) | (0.256) |
| Observations | 22051 | 17448 | 16130 | 14645 |
| $R^2$ | 0.448 | 0.452 | 0.450 | 0.448 |
| Controls | YES | YES | YES | YES |

Standard errors in parentheses

$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

*Notes*: The table reports regression results for expected own price growth on input price forecast errors. The dependent variable is shifted forward by up to three quarters. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

Figure 8: The sectoral pass-through of input price forecast errors to realised price growth




*Notes*: The figure presents regression results for the realised own price growth in relation to input price forecast errors across firms' characteristics. Input price forecast errors are defined as the difference between realised and expected input price growth. The shaded bands represent 90% confidence intervals. Additional controls are included (discussed in the main text but not shown). The analysis is based on SIGE data covering the period from 2017Q3 to 2024Q1.

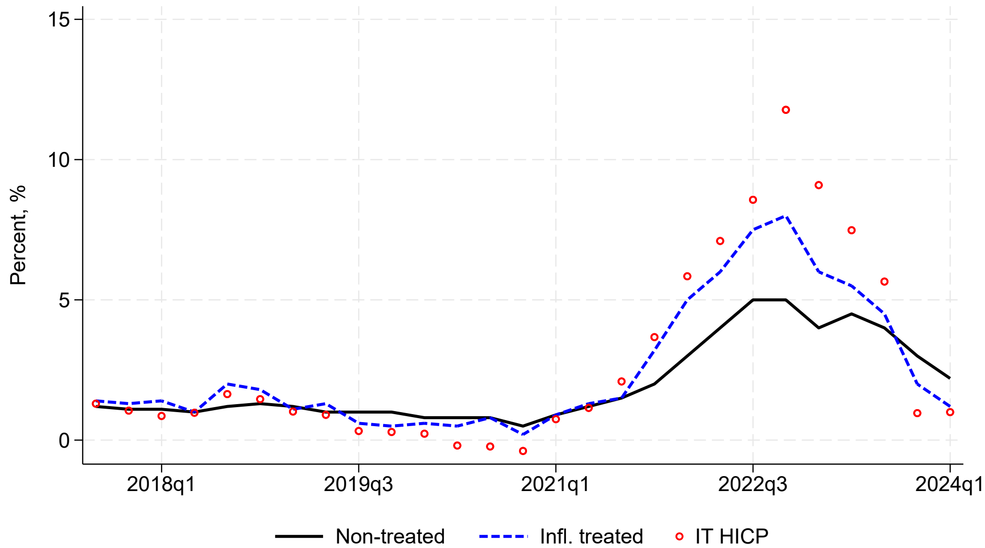
Table 11: Input price forecast errors and firms' expected inflation, persistency

| | (1)<br>Expected infl. (6m) | (2)<br>F.Expected infl. (6m) | (3)<br>F2.Expected infl. (6m) | (4)<br>F3.Expected infl. (6m) |
|---|---|---|---|---|
| Input price FE | 0.0361*** | 0.0326*** | 0.0190 | 0.00561 |
| | (0.0108) | (0.0127) | (0.0136) | (0.0143) |
| Constant | 2.823*** | 2.771*** | 2.807*** | 2.971*** |
| | (0.110) | (0.136) | (0.145) | (0.148) |
| Observations | 18930 | 15099 | 14026 | 12816 |
| $R^2$ | 0.807 | 0.809 | 0.806 | 0.804 |
| Controls | YES | YES | YES | YES |

Standard errors in parentheses
$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

*Notes*: The table reports regression results for the 6-month ahead expected inflation on input price forecast errors. The dependent variable is shifted forward by up to three quarters. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

Figure 9: Time series of the median 12-month ahead expected inflation by treatment status




*Notes*: The figure plots the evolution over time of the median 12-month ahead expected inflation for firms which receive the information treatment and those which do not. The data are sourced from the SIGE.

Table 12: Input price forecast errors and firms' expected inflation, persistency

| | (1)<br>Expected infl. (12m) | (2)<br>F.Expected infl. (12m) | (3)<br>F2.Expected infl. (12m) | (4)<br>F3.Expected infl. (12m) |
|---|---|---|---|---|
| Input price FE | 0.0244** | 0.0323** | 0.0227* | 0.0108 |
| | (0.0109) | (0.0129) | (0.0135) | (0.0143) |
| Constant | 2.489*** | 2.364*** | 2.412*** | 2.447*** |
| | (0.111) | (0.130) | (0.133) | (0.146) |
| Observations | 18939 | 15108 | 14041 | 12831 |
| $R^2$ | 0.744 | 0.744 | 0.744 | 0.741 |
| Controls | YES | YES | YES | YES |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

*Notes*: The table reports regression results for the 12-month ahead expected inflation on input price forecast errors. The dependent variable is shifted forward by up to three quarters. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

Table 13: Input price forecast errors and firms' expected and realised own price growth

| | (1) Expected own price gr. | (2) Realized own price gr. | (3) Expected infl. (6m) | (4) Expected infl. (12m) | (5) Expected infl. (24m) | (6) Expected infl. (36-60m) |
|---|---|---|---|---|---|---|
| Input price FE, resid | 1.024*** | 0.605*** | 0.128*** | 0.0874** | 0.0576 | 0.0460 |
| | (0.109) | (0.147) | (0.0418) | (0.0417) | (0.0408) | (0.0402) |
| Constant | 2.126*** | 2.709*** | 2.790*** | 2.556*** | 2.295*** | 2.179*** |
| | (0.117) | (0.163) | (0.0688) | (0.0578) | (0.0554) | (0.0600) |
| Observations | 22051 | 16067 | 18930 | 18939 | 18937 | 18942 |
| $R^2$ | 0.459 | 0.474 | 0.809 | 0.746 | 0.655 | 0.588 |
| Controls | YES | YES | YES | YES | YES | YES |

Standard errors in parentheses

$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

*Notes*: The table reports regression results for expected own price growth, and realised price growth, all regressed on the residuals of input price forecast errors on firm-level characteristics. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1. Standard errors are clustered at the firm level.

Table 14: Input price forecast errors and firms' expected own price growth, robustness

| | (1) Cluster: ID Time*Sector | (2) Fixed effects: ID Time*Sector | (3) Lag shock | (4) Before 2021 | (5) Trimming 2-98 | (6) Trimming 5-95 |
|---|---|---|---|---|---|---|
| Input price FE | 0.283*** | 0.265*** | 0.259*** | 0.377*** | | |
| | (0.0340) | (0.0283) | (0.0325) | (0.0544) | | |
| Lag input price FE | | | 0.0797*** | | | |
| | | | (0.0261) | | | |
| Input price FE, 2-98 | | | | | 0.315*** | |
| | | | | | (0.0248) | |
| Input price FE, 5-95 | | | | | | 0.348*** |
| | | | | | | (0.0244) |
| Constant | 1.717*** | 2.020*** | 1.790*** | 0.785** | 1.681*** | 1.686*** |
| | (0.217) | (0.116) | (0.295) | (0.337) | (0.210) | (0.169) |
| Observations | 22051 | 22051 | 15395 | 9552 | 21243 | 19012 |
| $R^2$ | 0.448 | 0.459 | 0.479 | 0.503 | 0.459 | 0.527 |
| Controls | YES | YES | YES | YES | YES | YES |

Standard errors in parentheses

$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

*Notes*: The table reports regression results for the expected own price growth on input price forecast errors. A battery of different specifications is estimated. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2024Q1.

Table 15: Input price forecast errors and firms' expectations, low inflation period

| | (1) Expected own price gr. | (2) Realized own price gr. | (3) Expected infl. (6m) | (4) Expected infl. (12m) |
|---|---|---|---|---|
| Input price FE (+) | 0.444*** | 0.746*** | 0.0424*** | 0.0466*** |
| | (0.0711) | (0.176) | (0.0109) | (0.0114) |
| Input price FE (-) | 0.381*** | -0.268** | 0.0194 | 0.0207 |
| | (0.0751) | (0.128) | (0.0131) | (0.0138) |
| Constant | 0.946*** | 1.998*** | 1.111*** | 1.211*** |
| | (0.300) | (0.498) | (0.0726) | (0.0867) |
| Observations | 12836 | 9757 | 11119 | 11135 |
| $R^2$ | 0.483 | 0.526 | 0.637 | 0.617 |
| Controls | YES | YES | YES | YES |

Standard errors in parentheses

$^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

*Notes*: The table reports regression results for the firms' expectations on input price forecast errors. The input price forecast errors are defined as the difference between realised and expected input price growth. Additional controls are included, as discussed in the main text (but not shown here). The analysis is based on data from the SIGE for the period 2017Q3–2021Q4.