

How do supply shocks to inflation generalize? Evidence from the pandemic era in Europe*

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Abstract

We document how the interaction of supply chain pressures, elevated household inflation expectations, and firm pricing power contributed to the pandemic-era surge in consumer price inflation in the euro area. Initially, supply chain disruptions raised inflation, particularly in manufacturing through a cost-push channel, while also elevating inflation expectations. In turn, higher inflation expectations appear to have lowered the price elasticity of consumer demand and strengthened firms' pricing power, enabling even firms in service sectors that were initially unaffected by supply constraints to raise markups. Through this expectations mechanism, localized inflation in sectors sensitive to supply-side shocks generalized into broad-based inflation.

JEL: E31, E58, D84, L11.

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1 Introduction

“Elasticity is a relative thing. Elasticity is lower where there’s high levels of price inflation across the market. So we measure a relative price position. We are the price leader. Competition is following in pricing, and we’re measuring that.”

— Graeme Pitkethly (Unilever CFO), Q4 2021 Earnings Call, 10 February 2022.

In response to the outbreak of the COVID-19 pandemic in March 2020, governments and central banks implemented substantial stimulus measures to avert a deep recession. The global economy and aggregate demand rebounded rapidly, leading to a rise in inflation (see [Reis, 2022a](#)). Throughout 2021 and 2022, additional supply-side shocks intensified inflationary pressures. Notably, new pandemic waves and the resulting restrictions on economic activity put severe strain on global value chains, leading to shortages across sectors. Energy prices also began to climb in 2021. They surged in early 2022 after the Russian invasion of Ukraine, pushing inflation in many countries—particularly in the euro area—to its highest level in four decades. Initially, these supply-side shocks exerted more inflationary pressure on directly affected sectors such as manufacturing (see [Figure 1](#)). These shocks later eased, but inflation continued to spread across the European economy. It eventually reached sectors that were not directly affected by supply constraints, such as services.

Using several cross-sectional and time-series tests, we show how supply chain pressures, household inflation expectations, and firm pricing power interacted to fuel the pandemic-era surge and eventual generalization of consumer price inflation in the euro area. Our findings are consistent with the sequence of effects illustrated in [Figure 2](#).

First, we document that supply chain constraints began rising in late 2020 and early 2021 and passed through to prices (left panel). This cost pass-through was concentrated in the sectors most directly affected by the disruptions, primarily manufacturing. Second, we show that these localized constraints contributed to higher household inflation expectations, which began rising in early 2021 (middle panel). Households revised their expectations upward

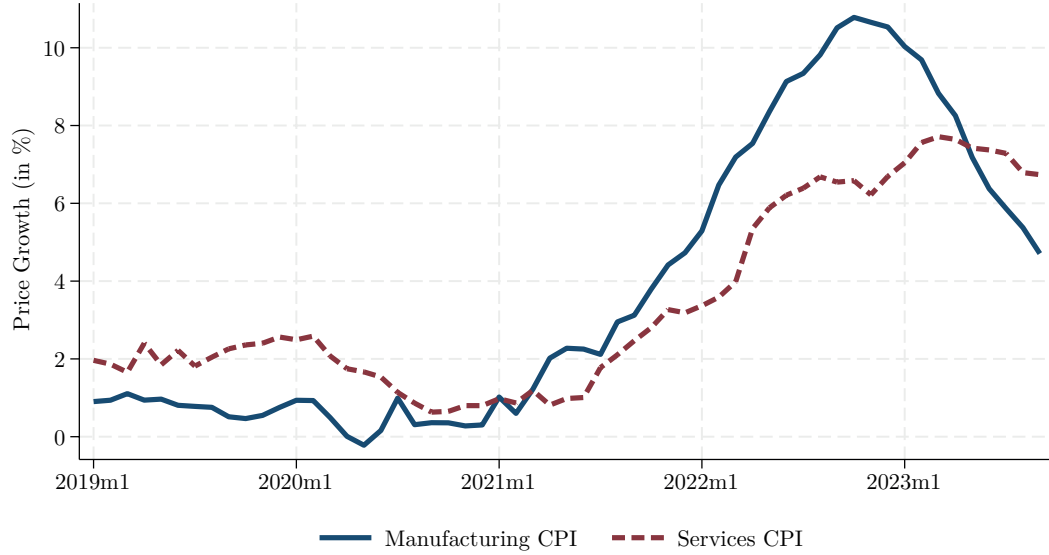


Figure 1: Manufacturing and services consumer price inflation. This figure shows the average CPI growth for manufacturing and services. Source: Eurostat.

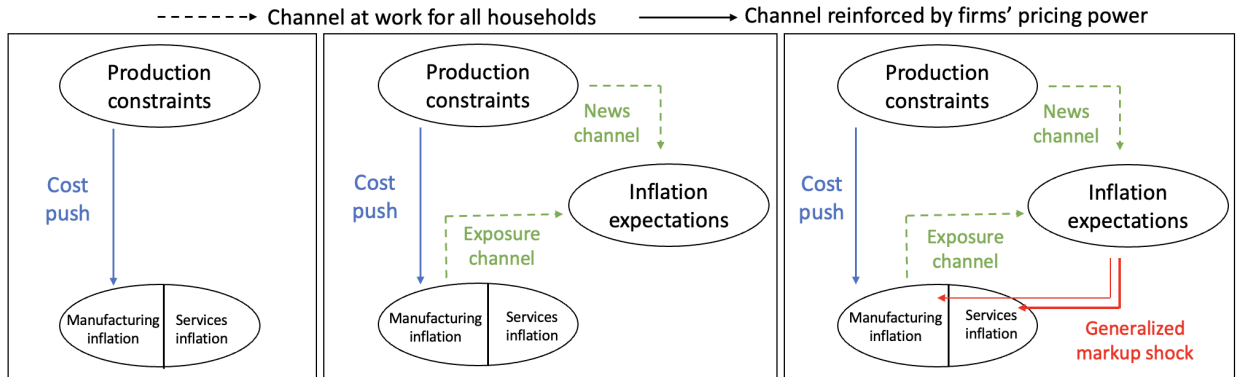


Figure 2: From supply chain constraints and localized inflation to high inflation expectations and generalized inflation. This figure shows the main channels at the core of our analysis. The left panel shows how production constraints might affect inflation through a cost-push channel. The middle panel shows how production constraints and inflation might increase inflation expectations. The right panel shows how inflation expectations might contribute to the rise in generalized inflation.

1 through two channels. They observed higher prices in their consumption baskets through
2 the *exposure channel* (e.g., D'Acunto et al., 2021), and they received news about supply-side
3 shocks—such as cargo ship delays signaling rising costs—through the *news channel* (e.g.,
4 Larsen et al., 2021). Ultimately, elevated inflation expectations appear to have facilitated

the emergence of broad-based inflation in the second half of 2021. Inflation rose even in sectors, primarily services, that were not initially affected by supply-side cost shocks. Taken together, our analysis suggests that elevated household inflation expectations are tightly associated with the transition from localized to broad-based inflation.

A potential explanation for the mechanism is as follows. Following supply-side disruptions, households face a signal-extraction problem: determining whether the shock and the resulting cost and price increases are local or widespread (Lucas, 1972, 1973). Consumers who perceive the shock as broad-based search less for better deals. Their reservation prices rise, and their price sensitivity falls, allowing even unaffected firms to raise markups (Benabou and Gertner, 1993; Fishman, 1996; Gaballo and Paciello, 2022). In addition, when price increases are perceived as driven by common cost pressures, they are viewed as more “fair,” further lowering demand elasticity (Eyster et al., 2021). Together, these mechanisms imply that generalized inflation perceptions can propagate higher markups even in sectors not directly hit by the initial shock. As noted by Unilever’s CFO, “elasticity is lower where there’s high levels of price inflation across the market.” This behavior allows even firms not affected by supply-side disruptions to sustain higher markups without significant sales losses. Our results provide evidence consistent with such “excuseflation.”¹

To conduct our tests, we combine several datasets across different units of observation. At the industry-country-time level, we observe (i) firms’ production constraints from the Joint Harmonised EU Programme of Business and Consumer Surveys (BCS), and (ii) information on production volumes and energy consumption from Eurostat. At the country-time and the household-time level, we observe inflation expectations from the BCS and the European

¹This term captures the idea that sellers may exploit unusual, opaque disruptions that appear broad or systemic in the eyes of consumers to raise prices (Bloomberg, “How ‘Excuseflation’ Is Keeping Prices—and Corporate Profits—High”; March 9, 2023).

1 Central Bank (ECB) Consumer Expectations Survey (CES), respectively. At the product-
2 country-time level, we observe Consumer Price Index (CPI) data from Eurostat. Finally, at
3 the firm-time level, we examine pricing strategies extracted from earnings call transcripts
4 in the LSEG Workspace Transcripts & Briefs database. We combine these transcripts with
5 financial data from Compustat Global and Bureau van Dijk’s Orbis to estimate firm markups.

6 Our analysis is structured in five parts. First, we use a stringent framework with product-
7 country, country-time, and product-time fixed effects to document the pass-through of sup-
8 ply chain constraints to prices. Consistent with a cost-push channel, product-country pairs
9 facing greater constraints exhibit higher CPI growth during the COVID-19 pandemic, partic-
10 ularly in manufacturing sectors. An instrumental variable (IV) estimation supports a causal
11 interpretation of this finding. Specifically, we instrument a market’s degree of supply chain
12 disruptions with its firms’ pre-COVID reliance on imports from China paired with Chinese
13 province-level data on lockdown stringency. We employ granular energy consumption and
14 price data to isolate (and confirm the robustness of) the impact of supply chain frictions on
15 inflation from the impact of the contemporaneous surge in energy costs.

16 Second, we show that supply chain constraints feed into broad-based inflation expecta-
17 tions. Specifically, countries with more prevalent supply chain constraints have a larger share
18 of households with elevated inflation expectations. At the individual level, tighter constraints
19 are also associated with higher short-term (one-year-ahead) and long-term (three-year-ahead)
20 expectations. We further substantiate the causal link between supply chain disruptions and
21 rising household inflation expectations using, again, the IV strategy based on the lockdown-
22 induced trade shock. The household-time-level estimation further shows that households
23 that were more aware of realized inflation during the initial cost-push phase respond more
24 strongly to tighter reported supply chain constraints. Their expected CPI growth rises by
25 more, particularly in countries with greater exposure to salient information about supply
26 chain disruptions. Our results support both the exposure and the news channel in shaping
27 household expectations.

Third, we find evidence consistent with elevated household inflation expectations facilitating a generalization of inflation to firms in service sectors; that is, markets not directly exposed to supply chain constraints. In particular, using our stringent fixed effects framework with product-country, country-time, and product-time fixed effects, we document that in countries with elevated household inflation expectations, products with a higher contribution from service sectors exhibit higher relative CPI growth in 2022 than similar products in countries with less pronounced inflation expectations. This relative catch-up in service prices is not accompanied by a statistically significant relative decline in service production volumes.

To further mitigate the concern that this effect is driven by demand factors, we employ several additional controls: (i) we account for potential pent-up demand by controlling for country-level energy costs and the intensity of lockdown measures during the COVID-19 pandemic; (ii) we include product-country-time fixed effects at the 1-digit COICOP level to absorb the impact of broader demand shocks on product categories; and (iii) we control for demand shifts across different product categories using data on final consumption expenditure of households at the product-country-time level. We also account for all components of contemporaneous *realized* inflation, thus ensuring that cross-country differences in service-sector price dynamics reflect differences in how broad-based and persistent inflationary pressures are perceived to be, rather than simply the fact that some countries experienced higher inflation.

We show that the generalization effect does not appear to reflect firms anticipating rising labor costs, as heightened household inflation expectations may translate into stronger wage demands. Moreover, we show that the generalization effect is robust to controlling for potential delays in the transmission of supply shocks through the supply chain; i.e., delayed upstream cost-push spillovers do not drive the generalization.

Fourth, we examine the role of firms' pricing behavior in the generalization of inflationary pressures and how it is shaped by household inflation expectations, firms' pricing power, and

1 their interaction. First, we show that inflation generalization is driven by product-country
 2 pairs in which firms have significant market power. We then analyze company earnings call
 3 transcripts systematically using a Large Language Model (OpenAI’s GPT-4o). We combine
 4 this analysis with firm-level financial data and markups estimated following Loecker and
 5 Warzynski (2012) to link elevated household inflation expectations to firms’ ability to sustain
 6 higher markups through increased pricing power. In line with our proposed mechanism, we
 7 find that executives of firms in countries with elevated household inflation expectations
 8 more frequently cite pricing power due to resilient demand (an indicator of low consumer
 9 price sensitivity) than executives in countries with lower inflation expectations. Moreover,
 10 references to resilient demand predict higher markups in the subsequent quarter. By contrast,
 11 firms refer less often to pricing power alongside scarcity-driven factors that also raise costs,
 12 such as supply chain disruptions, labor constraints, or energy costs. These references are
 13 generally not associated with markup increases.

14 Next, we examine how this dynamic differs across sectors. In 2022, once supply con-
 15 straints had eased but inflation expectations remained elevated, service-sector firms were
 16 able to catch up to manufacturing firms in their price increases, citing pricing power associ-
 17 ated with resilient demand. This pattern is consistent with pricing power linked to resilient
 18 demand contributing to the generalization of inflation across the economy.

19 In a final step, we further explore how firms’ pre-pandemic pricing power interacts with
 20 elevated household inflation expectations to shape their markup strategies. Consistent with
 21 our findings based on company earnings call transcripts, we find that in countries with ele-
 22 vated household inflation expectations, firms with higher pre-COVID pricing power sustained
 23 relatively higher markups and EBITDA margins in 2022 than similar firms in countries with
 24 more stable inflation expectations. This pattern holds in firm-level data from both Com-
 25 pustat Global and Bureau van Dijk’s Orbis. The result therefore applies not only to the
 26 large publicly listed firms used in our LLM-based analysis, but also to a broader and more
 27 representative population that includes private and smaller firms. These findings suggest

1 that the interaction between inflation expectations and firm-level pricing power can amplify
2 and propagate inflationary pressures throughout the broader economy.

3 Overall, our results suggest that opaque cost shocks, such as the one caused by supply-side
4 disruptions during the COVID-19 pandemic, can lead households to anticipate a broad-based
5 increase in input costs and prices. This, in turn, can give pricing power even to firms not
6 directly affected by the initial shock, allowing localized inflationary pressures to spread into
7 broad-based inflation. As inflation began to rise in 2021, central banks initially tolerated
8 elevated levels, assuming the supply shocks were transitory. However, our results highlight
9 that supply-side shocks that lead to a de-anchoring of inflation expectations can trigger a
10 disproportionate, widespread, and persistent surge in actual inflation, operating through a
11 rise in firms' pricing power.

12 **Related literature.** The literature on supply-side factors and their connection to inflation
13 and inflation expectations covers several interconnected areas of research, including (i) the
14 effect of supply shocks on prices, (ii) the formation of inflation expectations, and (iii) the
15 relationship between inflation and inflation expectations.

16 A variety of studies has investigated the impact of supply-side frictions on prices and price
17 expectations. In the theoretical literature, [Alessandria et al. \(2022\)](#) and [Kalemli-Ozcan et al. \(2022\)](#)
18 model the aggregate effects of supply chain shocks during the COVID-19 pandemic.
19 [Bilbiie and Känzig \(2023\)](#) investigates the interplay of corporate profits and income distribu-
20 tion in shaping inflation and aggregate demand. In the empirical literature, [Carriere-Swallow
21 et al. \(2022\)](#) and [Jiménez-Rodríguez and Morales-Zumaquero \(2022\)](#) examine the effects of
22 global shipping costs and commodity prices, respectively, on domestic prices and inflation
23 expectations. [Benigno et al. \(2022\)](#) and [Bai et al. \(2024\)](#) propose new indices to capture

1 global supply chain pressures and their impact on inflation.²

2 More closely related to our paper, [Franzoni et al. \(2023\)](#) focuses on the role of market
3 power in the propagation of the initial cost-push shock. The authors provide evidence that
4 supply chain constraints can help explain about 19% of U.S. inflation in industries with
5 a more asymmetric firm size distribution, where supply chain shortages are more likely to
6 benefit large firms at the expense of smaller ones. Similarly, [Bräuning et al. \(2022\)](#) investi-
7 gates the effect of market concentration on the pass-through of cost shocks into prices in the
8 U.S., suggesting that increased industry concentration may amplify local inflationary pres-
9 sures. We contribute to this literature by showing that supply-side shocks can *interact* with
10 household inflation expectations and firm pricing power, leading to broad-based inflation.

11 More generally, our paper is also related to the literature on the formation of inflation
12 expectations and their links to household and firm behavior, as well as inflation. [Weber](#)
13 [et al. \(2022\)](#) reviews the literature on inflation expectations, highlighting systematic upward
14 bias, large disagreements, high forecast uncertainty, deviations from professional forecasters,
15 joint short-long term adjustments (suggesting potential “unanchoring”), inattention in stable
16 economies, and varied expectations across countries. Moreover, there is a large body of work
17 on how inflation expectations affect households’ economic decisions ([Crump et al., 2022](#);
18 [Dräger and Nghiem, 2021](#); [D’Acunto et al., 2022](#); [Ichiue and Nishiguchi, 2015](#); [Duca-Radu](#)
19 [et al., 2021](#); [Armantier et al., 2015](#); [Malmendier and Nagel, 2016](#); [Coibion et al., 2023](#)). Our
20 paper adds to this literature by showing that shifts in inflation expectations (interpreted as
21 a proxy for perceived inflation-regime breadth and persistence) are closely associated with
22 the generalization of inflation following localized cost shocks.

²There is also a growing body of country-specific research on the effects of supply-side factors on inflation ([Isaacson and Rubinton, 2022](#); [Amiti et al., 2022](#); [Ball et al., 2022](#); [Anayi et al., 2022](#); [Bernanke and Blanchard, 2023](#); [Comin et al., 2023](#); [Finck and Tillmann, 2022](#); [Celasun et al., 2022](#); [Binici et al., 2022](#)).

2 Data and stylized facts

In this section, we outline our data sources (Section 2.1), highlight key stylized facts that characterize the post-pandemic inflationary environment in the euro area (Section 2.2), and discuss our conceptual framework and hypotheses (Section 2.3).

2.1 Data sources

Our analysis is based on several data sets for the euro area from 2019:Q1 to 2022:Q4. We use data about (i) firms’ production constraints, (ii) household inflation expectations, (iii) CPI growth and price-adjusted production volumes, (iv) firm financials, and (v) corporate earnings call transcripts. Table OA.1 in the Online Appendix presents summary statistics for the main variables.

Joint Harmonised EU Programme of Business and Consumer Surveys (BCS).

We obtain information about firms’ production constraints at the industry-country-time level and household inflation expectations at the country-time level from the BCS conducted by the European Commission’s Directorate-General for Economic and Financial Affairs (DG ECFIN). These surveys are conducted on a monthly and quarterly basis, covering 37,990 corporations across the manufacturing, services, retail trade, and construction industries, as well as 31,810 households from the 27 EU member countries.³

Specifically, from the BCS firm survey, we employ responses to the quarterly Question 8, which asks firms: “*What main factors are currently limiting your production?*” Firms can respond with (only) one of the following factors: (i) none, (ii) insufficient demand, (iii)

³Manufacturing firms are asked about firm-specific factors, such as production capacity, competitive position, price expectations, and factors constraining production. Consumers are questioned on both objective variables (e.g., inflation and the country’s general economic situation) and subjective assessments (e.g., major purchases and savings).

1 shortage of labour force, (iv) shortage of material and/or equipment, (v) financial constraints,
2 or (vi) other factors. The BCS then reports, at the industry-country-time level, the share of
3 firms that respond that their production is constrained by the respective factor.

4 The use of survey data to gauge constraints to firms' production stemming from supply
5 chain disturbances offers two key advantages: (i) Survey data offers more immediate and
6 direct evidence regarding firms' production constraints compared with raw supply chain
7 data, which may not fully capture their extent due to firms' ability to adapt, either through
8 sourcing alternative material inputs or adjusting their supply chains; (ii) Survey data about
9 constraints to production can serve as a leading indicator for increases in supply-side costs
10 since firms often anticipate the impact of supply shocks, such as container ship congestion,
11 before they translate into a tangible material shortage.

12 From the BCS household survey, we obtain inflation expectations at the country-time
13 level from Question 6 that asks: *“By comparison with the past 12 months, how do you*
14 *expect that consumer prices will develop in the next 12 months?”* Respondents can reply: (i)
15 increase more rapidly, (ii) increase at the same rate, (iii) increase at a slower rate, (iv) stay
16 about the same, or (v) fall. Following D'Acunto et al. (2022), we use the share of households
17 expecting prices to increase more rapidly to measure high inflation expectations.

18 **ECB Consumer Expectations Survey (CES).** Furthermore, we use newly available
19 anonymized household-time-level inflation expectations microdata from the CES launched in
20 2020. Its sample covers six key euro area countries: Belgium, France, Germany, Italy, Spain,
21 and the Netherlands, and it is representative of the euro area population (Bańkowska et al.,
22 2021). The CES comprises monthly *core*, *background*, and *recruitment* questionnaires, as
23 well as a quarterly questionnaire. The core questionnaire addresses households' expectations
24 regarding macroeconomic conditions, housing markets, and their financial situation. The
25 quarterly and background modules contain additional questions on household expenditures,
26 savings, employment, borrowing, risk attitudes, financial knowledge, and income. A total

of 18,492 distinct respondents participated in the 12 CES waves, and households appear repeatedly in the survey, allowing us to compare responses of the same household over time.

To measure inflation expectations at the country-time and household-time level consistently across the two surveys (BCS and CES), we use the responses to CES’ Question C1110 that asks households: *“Looking ahead to 12 months from now, what do you think will happen to prices in general?”* Similar to the BCS, households can answer: (i) prices will increase a lot, (ii) prices will decrease a lot, (iii) prices will increase a little, (iv) prices will decrease a little, or (v) prices will be exactly the same (that is 0% change). We again classify a household as having high inflation expectations if the household responds that prices will increase a lot.

Additionally, the CES provides insight into households’ long-term inflation expectations. Specifically, Question C1210 asks: *“Please think further ahead to <survey month year+2>. What do you think will happen to prices in general in the country you currently live in over the 12-month period between <survey month year+2 and survey month year+3>?”* Again, we classify a household as having high inflation expectations if it indicates that prices will increase a lot.

Other data sources. We obtain monthly data on consumer prices at the product-country-time level (products are grouped in COICOP categories), industry-country-time-level data on production volumes, energy input use, and worker compensation, country-time-level data on energy prices, government expenditures, and online shopping-related search activity, an industry-country-level input-output table, and data on product-country-time-level household expenditures from Eurostat. In addition, we draw markups and capital-labor intensity at the industry-country level from the 9th vintage of the CompNet database. For our Large Language Model (LLM) analysis, we use OpenAI’s GPT-4o model to analyze earnings call transcripts from the LSEG Workspace Transcripts & Briefs database (see [Section 5.1](#) for more details). Finally, we obtain firm-time-level financial data from Compustat Global and

Bureau van Dijk’s Orbis to estimate firm markups, and leverage Google Trends data as a proxy for households’ information acquisition.

Data transformations. We transform variables from the industry-country-quarter level to the product-country-quarter level in two steps. First, we use an EU inter-country input-output table (Eurostat Figaro) to capture industries from different countries contributing to the sales of a specific product in a specific country.⁴ For example, cars sold in Germany are produced not only in Germany but also in Italy, Spain, etc.

Second, we use the inverse of the COICOP-CPA matrix from Cai and Vandyck (2020) to transform production constraints from the industry-country-time level to the product-country-time level by calculating a weighted constraints measure for all CPA categories related to a COICOP category (two digits). Consider, for example, the product category “Food and non-alcoholic beverages” (COICOP 01). This product’s COICOP is a weighted average of, among others, the following CPA categories: (i) products of agriculture, hunting, and related services, (ii) fish and fishing products, and (iii) food products.

Similarly, we transform variables from the industry-country-time level to the country-time level using the share of consumption that each industry contributes to the final household consumption (using the COICOP-CPA matrix from Cai and Vandyck, 2020) as weights.

2.2 Stylized facts: From localized to generalized inflation

The COVID-19 pandemic triggered a contemporaneous surge in supply chain disruptions, inflation, and inflation expectations across the euro area.

The top panel in Figure 3 shows that firms began reporting significant shortages of material inputs in 2021:Q1, followed by less pronounced labor shortages from 2021:Q2 onward.

⁴The Figaro data is available at <https://ec.europa.eu/eurostat/web/esa-supply-use-input-tables>.

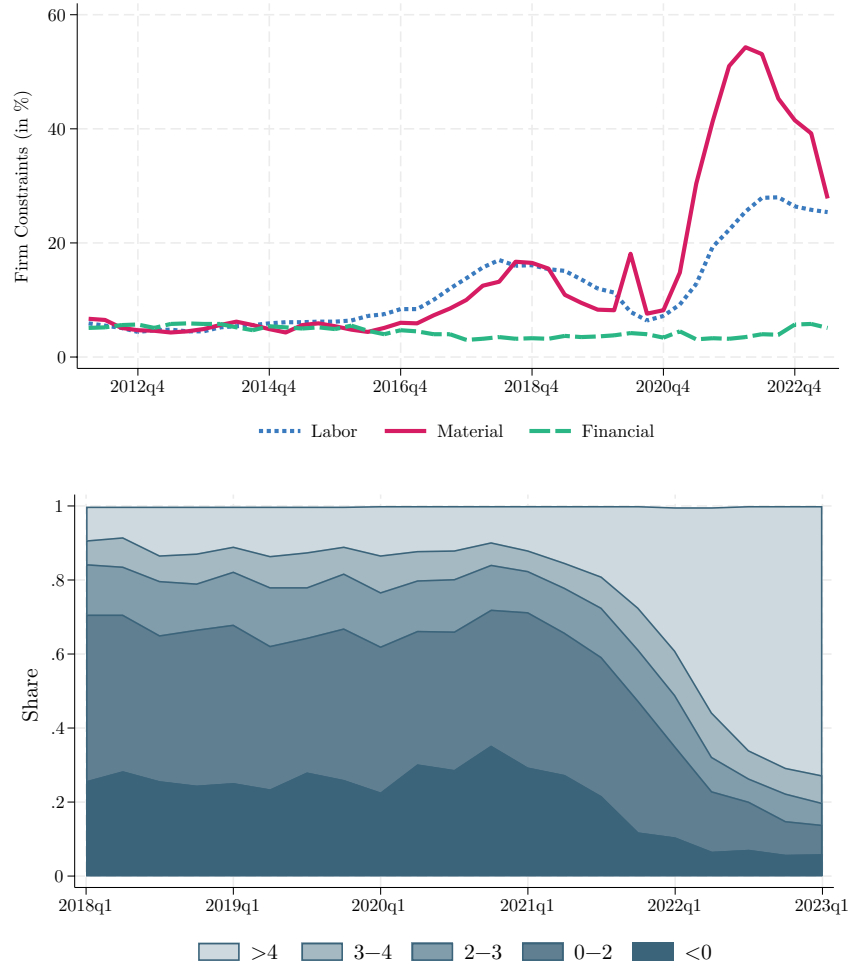


Figure 3: Production constraints and localized inflation in 2021 becoming broad-based in 2022. The top panel shows the share of firms answering the following survey question: “What main factors are currently limiting your production?” as follows: (i) shortage of labor, (ii) shortage of material/equipment, (iii) financial constraints. The data are collected monthly from January 2016 to April 2023 and are obtained from the BCS firm survey for 27 EU countries, with the unit of observation being industry-country. The bottom panel provides a visual representation of inflation trends at the product-country-time level in the euro area. Each shaded area shows the share of product-country pairs that, in each quarter, have a specific year-over-year CPI growth rate as outlined in the legend.

Both production constraints began easing by 2022:Q1 and 2022:Q3, respectively. Supply chain shocks often prompt producers to raise prices to protect profit margins amid challenges in sourcing materials and elevated input costs. Consistent with this mechanism, the CPI began to rise in 2021:Q1, peaking in October 2022 (see [Figure OA.1](#)). Although price increases may propagate through firm-to-firm linkages, the initial cost-push inflationary im-

pulse remained primarily confined to products in sectors directly affected by the supply-side shock, such as manufacturing.

Then, starting in the second half of 2021, localized inflation in supply-sensitive sectors gave way to a more widespread inflationary environment, with even sectors not directly affected by supply chain disruptions, such as services, experiencing high inflation rates (see the bottom panel of [Figure 3](#)). By late 2021, CPI year-over-year growth was 5%, with 27% of products experiencing inflation above 4% and 50% below 2%. By the end of 2022, CPI had risen to 9%, with 70% of products exceeding 4% inflation.⁵

2.3 Conceptual framework and hypotheses

This transition from localized to generalized inflation can be plausibly explained by an interplay among supply-side disruptions, inflation expectations, purchasing behavior, and firm pricing power.

While their direct cost-push impact was initially localized, the supply-side constraints during the COVID-19 pandemic gradually generalized into broad-based inflation expectations, with both households and firms coming to expect higher inflation ([Figure 4](#)).⁶

⁵[Figure OA.2](#) confirms this transition to generalized inflation, displaying the survey-based measure of supply chain constraints alongside an “inflation diffusion” index. Despite easing supply chain bottlenecks in 2022, the index continued to rise as inflation became more broad-based.

⁶These expectations are measured as the share of households or firms expecting prices to increase more rapidly minus the share of households or firms expecting inflation to fall over the next 12 months for households and 3 months for firms (see [Weber et al., 2022](#); [D’Acunto and Weber, 2024](#)). [Figure OA.3](#) shows three snapshots of the distribution of one-year-ahead households’ inflation expectations. Inflation expectations by households and firms shift to the right and become more fat-tailed in 2021 and especially 2022, mirroring past episodes where inflation expectations became unanchored ([Reis, 2022b](#)). Using a representative sample of the U.S. population, [Andre et al. \(2024\)](#) demonstrates that even in the U.S., a country less exposed to supply-side shocks than Europe, households overwhelmingly identified supply-side factors as key drivers of the inflation surge in late 2021 and 2022.

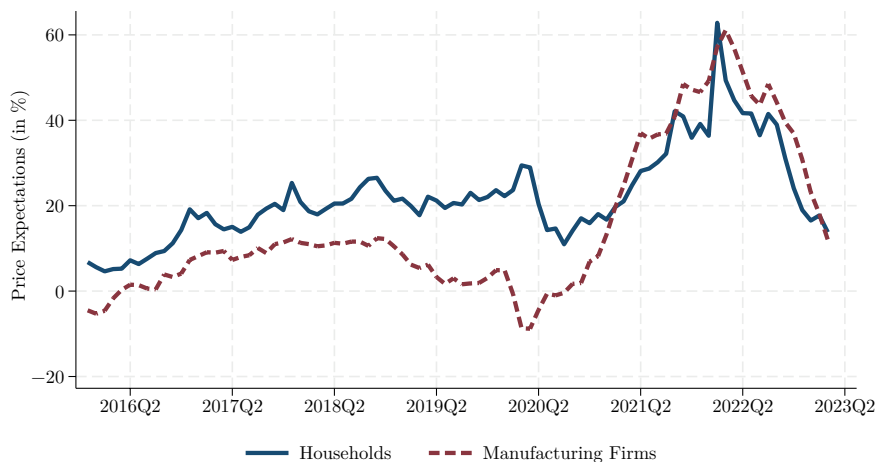


Figure 4: Rising inflation expectations. This figure shows the evolution of households' and manufacturing firms' inflation expectations over time. These expectations are measured as the share of households/firms expecting prices to increase more rapidly minus the share of households/firms expecting inflation to fall over 12 months (for households) and 3 months (for manufacturing firms). The data source is the monthly survey on households' and firms' inflation expectations in the euro area.

1 **How inflation expectations are formed.** The effect of supply chain disruptions on
2 inflation expectations works through at least two channels: the *exposure* channel and the
3 *news* channel. The exposure channel operates through the observable effect of supply-side
4 shocks on prices. Being exposed to recent price increases leads households to update their
5 aggregate inflation perceptions and expectations, anticipating similar price movements in the
6 future (Cavallo et al., 2017; D'Acunto et al., 2021). The news channel influences inflation
7 expectations through information about economic developments that are perceived to have
8 an impact on prices (Carroll, 2003; Dräger and Lamla, 2017; Larsen et al., 2021; Mazumder,
9 2021; Andre et al., 2024). For example, following reports about shipping container backlogs
10 at Chinese ports, consumers may anticipate rising production costs and adjust their inflation
11 expectations even before any observable price changes.⁷

⁷The most recent evidence on this pass-through shows that U.S. consumers expect tariff policies to significantly affect the prices of both imported and domestically produced goods (Coibion et al., 2025).

Supply-side shocks can generate broad-based inflation expectations when households perceive costs and prices as rising uniformly. This response stems from how households form expectations. Following a supply-side disruption, households must determine whether the shock and the resulting increases in costs and prices are local or widespread. This signal-extraction problem influences their consumption choices. This is closely related to the classic Lucas (1972, 1973) framework, in which agents infer aggregate conditions from local price movements, and to later models of imperfect and sticky information (e.g., Mankiw and Reis, 2002; Sims, 2003; Woodford, 2003), where agents only imperfectly observe or process aggregate shocks. In our context, households observe or hear about price increases in goods due to supply bottlenecks and may interpret them as evidence of a generalized inflationary environment.

This macro-based signal-extraction perspective is complementary to micro-founded models of belief formation in which individuals extrapolate from salient, local experiences when forming expectations about aggregate outcomes. As explored in the diagnostic expectations literature (Bordalo et al., 2018, 2019, 2012, 2021), individuals tend to infer broader economic trends from specific, salient incidents, and often overweight recent events when predicting future outcomes. Consistent with this framework, Link et al. (2024) shows that consumers who are particularly attentive and informed about realized inflation rates have inflation expectations that deviate more significantly upward from professional forecasts than less attentive individuals. This finding suggests that consumers rely on their own (potentially misspecified) models when processing inflation-relevant information (see also Andrade et al., 2016; Andre et al., 2022; Laudenbach et al., 2024).

In the case of the exposure channel, salient events include extreme price increases due to supply disruptions (De Bruin et al., 2011) and spikes in the cost of everyday goods such as food or gasoline (Cavallo et al., 2017; D’Acunto et al., 2021; Dietrich, 2024). These salient price increases lead consumers to place significant weight on them when forming their expectations about *overall* price trends. In the case of the news channel, salient events

1 include reports about supply chain disruptions and their effects on costs and prices, especially
2 when the media emphasizes potential economy-wide implications.⁸

3 Besides diagnostic expectations, rational inattention (Sims, 2003) and sparsity (Gabaix,
4 2014) can also lead to generalized inflation expectations. Due to cognitive limitations, in-
5 dividuals face a trade-off between the benefits of acquiring additional information and the
6 costs (time, effort, or cognitive resources) of processing it. Individuals thus tend to focus
7 on the most relevant information while ignoring less critical details. In the context of in-
8 flation, individuals thus typically base their expectations on easily observable price signals
9 (D’Acunto and Weber, 2024), such as rising prices of frequently purchased goods or news
10 about increases in headline inflation, while selectively ignoring complex or technical infor-
11 mation, such as disaggregated inflation data.⁹ If these easily observable signals indicate
12 higher inflation, individuals may generalize this perception to the broader economy. If a
13 supply shock elevates generalized inflation expectations, it is likely perceived as widespread:
14 a common cost shock affecting many firms.¹⁰

15 **Perception of common cost shock and firm markups.** In Appendix OA.4, we present
16 a simple theoretical model of two non-mutually-exclusive channels: the *price search* channel
17 and the *customer antagonization* channel. Both channels show how the perception of a
18 common cost shock—a shock affecting many firms and a perception aligned with generalized

⁸Since reports of supply-side constraints are often more salient and newsworthy, while their resolution receives little attention, this asymmetry can contribute to the persistence of elevated inflation expectations. Supporting this notion, Ascari et al. (2023) finds that increases in inflation expectations have a stronger impact than shocks that lower them, and Blanco et al. (2022) finds that inflation surges elevate long-term inflation expectations, which remain persistent throughout the disinflation process.

⁹Relatedly, the theory proposed by Mei and Wu (2024) suggests that longer causal chains exert diminishing influence on beliefs, resulting in an overreaction of inflation expectations to cost-push news shocks.

¹⁰Acharya et al. (2023) demonstrates that in a regime-switching model with parameter uncertainty, a *negative duration dependence* can take hold: if the economy remains in a regime for an extended period, even fully rational agents may begin to assign via learning a higher likelihood to the possibility of being in the regime with persistence, potentially indefinitely.

inflation expectations (Dietrich, 2024)—can raise markups and prices, particularly in sectors not directly affected by the initial localized supply-side shock.

The price search channel operates as follows. In response to a supply shock, consumers must assess the extent to which individual firms are affected to make optimal decisions about their search efforts and subsequent consumption choices. Building on the search model from Benabou and Gertner (1993), we show in Appendix OA.4.2 that consumers search less for better deals when they perceive a supply shock as widespread. When confronted with a high price, they anticipate that prices will also be high elsewhere in the market (see also Fishman, 1996 and Gaballo and Paciello, 2022). This response raises reservation prices and lowers the price elasticity of demand, particularly in service-intensive sectors that were not materially affected by the initial supply-side shocks. In other words, households become less “choosy” and enter into less favorable transactions. Consequently, even firms that are not directly affected by the initial supply chain disruptions can “hide” behind aggregate cost and inflationary noise and maintain, or even raise, their markups without risking a considerable decline in sales.

The customer antagonization channel was first discussed by Blinder et al. (1998) and later formalized in a standard New Keynesian setting by Rotemberg (2005). Firms may be reluctant to raise prices because customers can perceive increases that stand out from competitors’ prices as unfair. Empirical evidence suggests that consumers tend to view price increases driven by rising costs as more acceptable than those driven by demand shocks (see Eyster et al., 2021 for a detailed discussion). Drawing on the fairness-concern framework in Eyster et al. (2021), we show in Appendix OA.4.3 that the overestimation of a localized supply-side shock as a common shock (driven by elevated generalized inflation expectations) causes consumers to perceive firms’ prices as more fair. This perception reduces their price elasticity of demand, again allowing firms, particularly those less directly affected by the initial supply-side shock, to charge higher markups and prices without significantly affecting demand.

A further, more traditional, cost-push channel through which higher inflation expectations can affect prices operates via wage costs (e.g., [Phelps, 1968](#); [Taylor, 1980](#); [Reis, 2023](#)). When workers and unions anticipate persistently higher inflation, they demand higher nominal wages to preserve real incomes, raising firms’ labor costs and putting upward pressure on prices, especially in labor-intensive service sectors.

Testable predictions. This framework yields three testable predictions that we take to the data. First, supply-side disruptions should have a direct cost-push effect on prices in supply-sensitive sectors (notably manufacturing), leading to higher inflation in product-country pairs facing tighter material input constraints ([Section 3.1](#)). Second, these same supply shocks should also raise household inflation expectations, with stronger responses among households more attentive to inflation and in countries more exposed to salient information about supply disruptions ([Section 3.2](#)). Third, elevated inflation expectations should strengthen firms’ pricing power, allowing even firms in less directly affected, more service-intensive markets to raise markups and prices ([Section 4](#) and [Section 5](#)).

3 Pass-through of supply chain constraints

We start by presenting evidence consistent with a post-COVID pass-through of supply chain disruptions to price levels through a cost-push channel ([Section 3.1](#)) and to household inflation expectations ([Section 3.2](#)).

3.1 Pass-through to localized inflation

We first document the initial *localized* cost-push inflationary impulse using cross-sectional variation in supply chain disruptions at the product-country level, and confirm this relationship with an IV strategy that isolates exogenous variation in supply shocks.

Baseline analysis. We test the effect of supply chain pressures (as perceived by firms) on CPI growth by estimating the following specification at the product-country-quarter level:

$$\Delta CPI_{pct+1} = \beta_1 Material_{pct} + \mu_{pc} + \nu_{ct} + \xi_{pt} + \epsilon_{pct}, \quad (1)$$

where p is a product, c is a country, and t is a quarter. $Material_{pct}$ measures the share of firms producing product p for the market in country c , indicating that their production is constrained by supply chain bottlenecks. The sample period spans 2019:Q1 to 2022:Q4 at a quarterly frequency. We measure the CPI growth in quarter t as the CPI growth from quarter t to quarter $t + 1$.

In our most stringent specification, we include product-country (μ_{pc}), country-time (ν_{ct}), and product-time (ξ_{pt}) fixed effects, which allow us to isolate the effect of firms' supply constraints while holding constant time-varying demand at both the country and product levels. Specifically, the country-time fixed effects absorb all national shocks that might influence prices (e.g., seasonality, country-level demand shocks, energy shocks, government support packages, and changes in tax legislation and national regulations). Product-time fixed effects account for shocks common to a given product across all countries in a given period (including product-specific seasonality). Product-country fixed effects control for time-invariant characteristics specific to each product-country pair. Identification thus comes from variation across countries within the same product and quarter, net of national-level shocks.

Our analysis includes firms in both manufacturing and services. For manufacturing firms, we observe supply chain constraints (*Material*), alongside other supply factors (*Labor*, *Financial*, and *Other*), all measured at the industry-country-quarter level. These variables capture the share of firms that report being constrained by each factor. For service firms, we observe shortages in equipment and space (*Equipment*), as well as *Labor*, *Financial*, and *Other*, but not *Material*. All constraint measures are mapped from the industry-country-

time level to the product-country-time level using an input-output table and information on each industry’s share in final household consumption of a given product (see [Section 2.1](#) for details). We conservatively measure supply chain constraints solely using the *Material* variable, setting this variable to zero for service firms.¹¹ We cluster standard errors at the country level. Since we have a small number of clusters (17 countries), we implement the [Imbens and Kolesar \(2016\)](#) “LZ2” correction to our standard errors and use a t-distribution with the degrees of freedom suggested by [McCaffrey and Bell \(2003\)](#) to compute confidence intervals.¹²

The first column of [Table 1](#) shows that supply chain constraints are positively associated with CPI growth. Specifically, a one-standard-deviation higher supply chain constraint value is associated with a 0.65pp higher annualized CPI growth rate, suggesting a meaningful pass-through of supply-side frictions to consumer prices.

In Column (2), we further control for the contemporaneous energy cost shock by including the interaction term $Energy\ Use_{pc} \times Energy\ Inflation_{ct}$, which allows us to disentangle the effect of supply chain frictions on inflation from the impact of rising energy costs. $Energy\ Inflation_{ct}$ is the time-varying country-level CPI for energy, capturing the evolution of a country’s overall energy costs over time. $Energy\ Use_{pc}$ is a product-country pair’s energy input before the COVID-19 pandemic, measured in 2019 and scaled by the country’s total energy use.¹³ The year 2019 provides a pre-COVID baseline for energy usage, reflecting “normal” economic conditions without pandemic-related distortions. Column (2) shows that accounting for energy costs does not significantly alter the coefficient capturing the impact of

¹¹If service firms did in fact experience positive material constraints, coding *Material* as zero for service sectors overstates the cross-sector gap in material frictions. For a given observed difference in prices between manufacturing and services, this tends to bias the estimated pass-through coefficient toward zero.

¹²We use the Stata program `clustermore`, written by Gabriel Chodorow-Reich for [Chodorow-Reich et al. \(2020\)](#), to implement this approach.

¹³Our results are robust to employing the nonscaled energy input level.

	(1)	(2)	(3)	(4)
	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}
Material_{pct}	0.011** (0.004)	0.011** (0.004)	0.011** (0.004)	0.016** (0.006)
$\text{Energy Use}_{pc} \times \text{Energy Inflation}_{ct}$		0.086* (0.048)	0.092* (0.045)	-0.025 (0.072)
Labor_{pct}			-0.016* (0.009)	-0.004 (0.006)
Financial_{pct}			-0.019 (0.017)	-0.008 (0.006)
Equipment_{pct}			-0.028 (0.034)	-0.018 (0.011)
Other_{pct}			-0.008 (0.006)	-0.002 (0.005)
Observations	8,518	8,518	8,518	8,518
R-squared	0.106	0.106	0.107	0.588
Country-time FE	✓	✓	✓	✓
Product-country FE	✓	✓	✓	✓
Product-time FE				✓

Table 1: Supply chain constraint pass-through to CPI. This table presents estimation results from Specification (1). The subscript notation is defined as follows: p is a product, c is a country, and t is a quarter. The dependent variable is the one-quarter-ahead CPI growth at the product-country-time level. Material_{pct} , Labor_{pct} , Financial_{pct} , Equipment_{pct} , and Other_{pct} measure the share of firms that indicate that their production is constrained by the respective constraint. $\text{Energy Inflation}_{ct}$ is the country-time level CPI for energy. Energy Use_{pc} is a product-country pair’s energy input before the COVID-19 pandemic, measured in 2019 and scaled by the country’s total energy use. We exclude the product “Energy” from the regression. Standard errors in parentheses are clustered at the country level using the “LZ2” bias-reduction modification of Imbens and Kolesar (2016). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

supply chain frictions, suggesting that, in terms of pass-through to CPI growth, the shocks from supply chain disruptions are largely orthogonal to those from energy costs.

In Column (3), we add controls for other production constraints (Labor_{pct} , Financial_{pct} , Equipment_{pct} , and Other_{pct}), while Column (4) includes product-time fixed effects. The estimated coefficient on supply chain constraints remains stable at 0.011 across Columns (1)–(3) and rises to 0.016 in the most stringent specification in Column (4), which corresponds to a 0.95pp higher year-on-year CPI growth for a one-standard-deviation higher supply chain constraint value.

IV estimation. Next, we conduct an IV regression approach. This analysis serves two purposes: first, to further validate our survey data; and second, to pinpoint exogenous

variation in supply chain frictions.

Conceptually, pandemic-related material constraints can arise from (i) direct supply chain disruptions (e.g., lockdowns, port closures, and transport bottlenecks) and (ii) limited scalability of input supply in the face of a sharp demand recovery. These mechanisms can also interact: supply disruptions make capacity constraints more binding when demand rebounds, and surging demand can, in turn, congest logistics networks.

Our IV strategy is designed to isolate the exogenous component of these frictions, driven by COVID-19 lockdowns in Chinese export provinces, while holding constant demand conditions within product-country pairs. This allows us to separate supply-chain-induced material constraints from those arising solely from rising consumer demand and a lack of scalability. Specifically, we instrument the degree of supply chain disruptions faced by firms selling a given product in a given country with their pre-pandemic reliance on imports from China and their resulting susceptibility to the disruptions caused by COVID-19 lockdowns in China:

$$\tilde{B}_{pct} = \text{China Dependence}_{pc,2019} \times \text{Lockdown Stringency}_t,$$

where *China Dependence*_{pc,2019} is the share of material inputs that the respective firms imported from China in 2019 to produce and sell product *p* in country *c* (using data from Eurostat Figaro), while *Lockdown Stringency*_{*t*} measures the severity of lockdown measures implemented in the top-5 exporting provinces of China (Guangdong, Jiangsu, Shandong, Shanghai, and Zhejiang) using data from the Oxford COVID-19 Government Response Tracker project (OxCGRT).¹⁴ Our instrument thus derives all of its cross-sectional varia-

¹⁴OxCGRT provides the COVID-19 Stringency Index, a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). We focus on lockdowns in the five leading Chinese provinces in export contributions to more precisely capture supply chain disruptions. Note that export volumes do not significantly correlate with the severity of COVID-19-related government policies at the provincial level. For instance, Guangdong, despite

tion from exposure of a product’s supply chain to material imports from China, and all of its time-series variation from lockdown-induced disruptions.

Table 2 presents the results of the IV estimation. Column (2) reports the first-stage regressions, while Column (1) presents the second-stage results. The instrument has a positive and statistically significant effect on reported material frictions ($Material_{pct}$), with F-statistics above the conventional threshold of 10 used to rule out weak instruments (Staiger and Stock, 1997).

In the second-stage estimation, we replace the $Material_{pct}$ frictions with the predicted $\widehat{Material}_{pct}$ frictions from the first stage. The dependent variable is again the one-quarter-ahead CPI growth at the product-country-time level. The IV-estimated coefficients confirm the positive effect of increased reported material frictions on CPI growth, suggesting a causal impact of supply chain disruptions on CPI growth. These results are consistent with recent evidence on supply-side disruptions in Europe (Finck and Tillmann, 2022; Binici et al., 2022; Celasun et al., 2022).

3.2 Pass-through to higher inflation expectations

To examine the pass-through from supply chain constraints to household inflation expectations, we run three sets of empirical tests: (i) a baseline analysis at the household-quarter level using data from the ECB’s CES; (ii) an extended analysis incorporating measures of households’ awareness of past inflation and their exposure to salient information about supply chain disruptions; and (iii) complementary evidence at the country-quarter level using

being a top exporter, experienced relatively moderate COVID-19 restrictions. Conversely, Xinjiang, with some of the most stringent lockdown measures, ranks low in export volumes. To create the consolidated top-5 export COVID-19 stringency index, we take the average of the province-time level index for the top-5 export provinces, collectively representing 67% of the national export total. See Figure OA.4 for the time-series evolution of this aggregate lockdown stringency index.

	CPI Growth		Inflation Expectations		
	(1) $\Delta \text{CPI}_{pct+1}$	(2) Material_{pct}	(3) $\hat{\pi}_{hct}^{e,ST}$	(4) $\hat{\pi}_{hct}^{e,LT}$	(5) Material_{ct}
$\widehat{\text{Material}}_{pct}$	0.064* (0.031)				
$\widehat{\text{Material}}_{ct}$			4.606*** (1.164)	2.181*** (0.576)	
China Dependence _{pc,2019} × Lockdown Stringency _t		3.749*** (0.706)			
China Dependence _{c,2019} × Lockdown Stringency _t					0.084*** (0.022)
F-Test	28.179		15.32	15.32	
Observations	8,438	8,438	126,080	126,080	126,080
R-squared		0.957			0.943
Product-Country FE	✓	✓			
Product-Time FE	✓	✓			
Country-Time FE	✓	✓			
Household FE			✓	✓	✓
Year FE			✓	✓	✓

Table 2: Supply chain constraint pass-through to CPI and household inflation expectations: IV estimation.

This table presents the estimation results from the IV specifications. The subscript notation is defined as follows: h is a household, p is a product, c is a country, and t is a quarter. The first stage results are shown in Columns (2) and (5), the second stage results in Columns (1), (3), and (4). The dependent variable in Column (1) is the one-quarter-ahead CPI growth at the product-country-time level. The dependent variables in Columns (3) and (4) are a household-time-level dummy equal to one if household h believes prices will increase a lot over the next 12 months (Column (3)) and equal to one if household h believes prices will increase a lot over the 12-month period between current year+2 and current year+3 (Column (4)). *China Dependence*_{pc,2019} and *China Dependence*_{c,2019} measure the exposure to inputs imported from China in 2019 at the product-country and country level, respectively. *Lockdown Stringency*_t measures the severity of lockdown measures implemented in China’s top-5 exporting provinces. Columns (1)–(2) include non-reported controls for the other perceived constraints to production (*Labor*_{pct}, *Financial*_{pct}, *Equipment*_{pct}, and *Other*_{pct}) and, in addition, the interaction of *Energy Inflation*_{ct} and *Energy Use*_{pc}. Columns (3)–(5) include non-reported controls for government expenditures as a percentage of GDP, the other perceived constraints to production (*Labor*_{ct}, *Financial*_{ct}, *Equipment*_{ct}, and *Other*_{ct}), as well as *Perceived (realized) Inflation*_{hct}, which is household h ’s perception about the inflation over the last 12 months. *Material*, *Labor*, *Financial*, *Equipment*, and *Other* measure the share of firms that indicate that their production is constrained by the respective constraint. *Energy Inflation*_{ct} is the country-time level CPI for energy. *Energy Use*_{pc} is a product-country pair’s energy input before the COVID-19 pandemic, measured in 2019 and scaled by the country’s total energy use. In Columns (1)–(2), we exclude the product “Energy” from the regression. Standard errors are clustered at the country level in Columns (1)–(2) and at the country-income-group level in Columns (3)–(5). We report standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

1 BCS consumer survey data. We interpret inflation expectations as an observable proxy
2 for the extent to which agents perceive that pandemic-related cost shocks have shifted the
3 economy toward a generalized and persistent inflation regime.

4 **Household-quarter level analysis.** The *household-quarter level* data from ECB’s CES
5 allows us to observe households’ short-term (one-year ahead) and longer term (three-year

ahead) inflation expectations. Accordingly, we employ the following two dependent variables. First, a dummy variable set to one if household h anticipates a significant price increase over the next 12 months. Second, a dummy variable set to one if household h expects a substantial price rise during the 12-month period starting two years from now and ending three years from now.

To formally gauge the impact of supply chain disruptions on inflation expectations at the household-quarter level, we estimate the following specification:

$$\begin{aligned}\hat{\pi}_{hct}^e = & \beta_1 \textit{Material}_{ct} + \beta_2 \textit{Food Inflation}_{ct} + \beta_3 \textit{Energy Inflation}_{ct} + \beta_4 \textit{Core Inflation}_{ct} \\ & + \beta_5 \textit{Perceived (realized) Inflation}_{hct} + \textit{Controls}_{ct} + \mu_{hc} + \nu_t + \epsilon_{hct},\end{aligned}\quad (2)$$

where h is a household, c is a country, and t is a quarter. We control for realized inflation, decomposed into core, energy, and food inflation, given that the latter two have been highlighted as strong drivers of household inflation expectations (Coibion and Gorodnichenko, 2015; D’Acunto et al., 2021; Cavallo et al., 2017; Wong, 2015). Alternatively, we directly control for households’ perception about inflation in the last 12 months (*Perceived (realized) Inflation_{hct}*), since the literature has identified households’ beliefs about the inflation over the recent past as a strong predictor of their inflation forecast (Ranyard et al., 2008). In our most stringent specifications, we additionally control for government expenditure as a percentage of GDP to account for fiscal stimulus that may independently influence inflation expectations, as well as for the other perceived constraints to production (*Labor_{ct}*, *Financial_{ct}*, *Equipment_{ct}*, and *Other_{ct}*).¹⁵

¹⁵Since households may differ systematically in their exposure and responsiveness to inflation-related news, residual dependence may arise among households in the same country and income group. We therefore cluster standard errors at the country-income-group level in this specification. Income groups are defined using *B7040-QUINTILE-Q*, the ECB Consumer Expectations Survey variable that assigns households to

Panel A: Short-Term Expectations	(1) $\hat{\pi}_{hct}^{e,ST}$	(2) $\hat{\pi}_{hct}^{e,ST}$	(3) $\hat{\pi}_{hct}^{e,ST}$	(4) $\hat{\pi}_{hct}^{e,ST}$	(5) $\hat{\pi}_{hct}^{e,ST}$	(6) $\hat{\pi}_{hct}^{e,ST}$	(7) $\hat{\pi}_{hct}^{e,ST}$
Material _{ct}	0.581*** (0.101)	0.530*** (0.105)	0.438*** (0.090)	0.417*** (0.092)	0.569*** (0.093)	0.547*** (0.086)	0.506*** (0.081)
Food Inflation _{ct}		1.050*** (0.111)	0.862*** (0.129)	0.471** (0.176)		0.594*** (0.214)	
Energy Inflation _{ct}			0.245*** (0.016)	0.237*** (0.018)		0.240*** (0.026)	
Core Inflation _{ct}				1.525*** (0.467)		1.512*** (0.478)	
Perceived (realized) Inflation _{hct}					1.089*** (0.078)		1.071*** (0.073)
Observations	126,080	126,080	126,080	126,080	126,080	126,080	126,080
R-squared	0.526	0.529	0.533	0.533	0.543	0.533	0.544

Panel B: Long-Term Expectations	(1) $\hat{\pi}_{hct}^{e,LT}$	(2) $\hat{\pi}_{hct}^{e,LT}$	(3) $\hat{\pi}_{hct}^{e,LT}$	(4) $\hat{\pi}_{hct}^{e,LT}$	(5) $\hat{\pi}_{hct}^{e,LT}$	(6) $\hat{\pi}_{hct}^{e,LT}$	(7) $\hat{\pi}_{hct}^{e,LT}$
Material _{ct}	0.152*** (0.025)	0.144*** (0.026)	0.127*** (0.022)	0.120*** (0.024)	0.147*** (0.023)	0.194*** (0.050)	0.207*** (0.042)
Food Inflation _{ct}		0.165*** (0.054)	0.130** (0.059)	-0.016 (0.085)		0.068 (0.115)	
Energy Inflation _{ct}			0.045*** (0.011)	0.042*** (0.011)		0.042*** (0.013)	
Core Inflation _{ct}				0.569** (0.271)		0.542* (0.295)	
Perceived (realized) Inflation _{hct}					0.486*** (0.024)		0.490*** (0.024)
Observations	126,080	126,080	126,080	126,080	126,080	126,080	126,080
R-squared	0.500	0.500	0.500	0.500	0.504	0.500	0.504

Additional controls						✓	✓
Household FE	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓

Table 3: Supply chain constraint pass-through to household inflation expectations: Household-level evidence. This table presents estimation results from Specification (2). The subscript notation is defined as follows: h is a household, c is a country, and t is a quarter. The dependent variables are a household-time-level dummy equal to one if household h believes prices will increase a lot over the next 12 months in Panel A and equal to one if household h believes prices will increase a lot over the 12-month period between current year+2 and current year+3 in Panel B. Columns (6)–(7) include non-reported controls for government expenditures as a percentage of GDP, as well as the other perceived constraints to production ($Labor_{ct}$, $Financial_{ct}$, $Equipment_{ct}$, and $Other_{ct}$). $Material_{ct}$, $Labor_{ct}$, $Financial_{ct}$, $Equipment_{ct}$, and $Other_{ct}$ measure the share of firms that indicate that their production is constrained by the respective constraint. $Food\ Inflation_{ct}$, $Energy\ Inflation_{ct}$, and $Core\ Inflation_{ct}$ are the country-time level CPI for food, energy, and core, respectively. $Perceived\ (realized)\ Inflation_{hct}$ is household h 's perception about the inflation over the last 12 months. Standard errors are clustered at the country-income-group level and are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The estimation results in Table 3 show that supply chain disruptions are positively associated with households' inflation expectations, both in the short term (Panel A) and the long term (Panel B). Even after controlling for the exposure channel (by including either realized inflation or households' perceptions of past inflation) the positive correlation between material input constraints and household inflation expectations persists. Both realized inflation and households' perceived inflation are strongly associated with higher short- and long-term inflation expectations, indicating that the exposure channel plays an important role in shaping expectations. Importantly, a significant positive association between supply chain constraints and inflation expectations remains even after accounting for the exposure channel, suggesting that the news channel also contributes to the formation of household inflation expectations.

The estimated effect is economically meaningful. For instance, the results in Column (5) of Panel A suggest that a one-standard-deviation increase in the share of firms reporting material frictions leads to a 6.3pp higher probability for a household to believe prices will increase a lot in the following year. This corresponds to 21% of the mean share of households expecting inflation to increase a lot.

IV estimation. To further substantiate the causal link between supply chain disruptions and rising household inflation expectations, we implement an IV strategy analogous to that in Section 3.1. As before, our instrument is the interaction between *China Dependence* (here measured at the country level) and *Lockdown Stringency_t*. The dependent variable is a household-level indicator for whether the household expects prices to increase significantly. Columns (3)–(5) of Table 2 report the results. The IV estimates confirm a positive effect of supply chain frictions on inflation expectations.

Household-quarter level analysis with interactions. In the second set of tests, we extend our analysis at the *household-quarter level* to explore the mechanisms through which the COVID-induced supply shocks shaped households' inflation expectations. Specifically,

we augment Specification (2) with two additional explanatory variables that serve as proxies for (i) households’ awareness of realized inflation during the initial cost-push phase, and (ii) households’ information about supply chain disruptions, conveyed through news media, peer discussions, interactions with employers, and similar channels.

Households with greater awareness of inflationary pressures caused by supply-side frictions are more likely to incorporate these perceptions into their inflation expectations (Link et al., 2024). To capture this awareness, we calculate the *within-household* correlation between households’ reported point estimates of headline inflation over the previous 12 months and actual inflation rates for the period 2020:Q2–2022:Q4. Using this metric, we construct a binary variable, $Awareness_{hc}$, which equals one for households whose correlation exceeds the sample median.

To proxy for households’ information sets regarding supply chain shocks, that is, their exposure to and active acquisition of information about these disruptions via news, online content, and other publicly available sources, we leverage Google Trends data, a widely used proxy for information acquisition in the social sciences (Choi and Varian, 2012; Korenok et al., 2022; Link et al., 2024; Fetzner et al., 2021).¹⁶ Specifically, we construct the variable $Google_{ct}$, which measures the intensity of Google searches for “delays in shipping” at the country-level, serving as a proxy for households’ exposure to and engagement with salient information about supply-side shocks.¹⁷ For this analysis, we focus on Germany, Italy, France, and Spain, the European countries with a sufficient volume of relevant searches.¹⁸

¹⁶Google Trends quantifies the search intensity for specific terms as a relative measure of search interest, where a value of 100 represents the peak popularity of the term for the specified region and time.

¹⁷This variable reflects heightened awareness and concern that drive the demand for additional information. Unlike metrics based on news article counts, it captures a wider range of information channels, including informal interactions with coworkers, peers, and social networks.

¹⁸We search for “Lieferschwierigkeiten” and “Lieferengpasse” for Germany, “tempi consegna” for Italy, “tiempo entrega” for Spain, and “délai de livraison” for France. These words maximize the number of searches available.

	(1) $\hat{\pi}_{hct}^{e,ST}$	(2) $\hat{\pi}_{hct}^{e,ST}$	(3) $\hat{\pi}_{hct}^{e,ST}$	(4) $\hat{\pi}_{hct}^{e,ST}$
Material _{ct}	-0.228*** (0.083)		0.552* (0.277)	
Material _{ct} × Awareness _{hc}	1.517*** (0.138)	1.209*** (0.119)	0.687* (0.374)	0.503* (0.283)
Material _{ct} × Awareness _{hc} × Google _{ct}			1.383** (0.524)	1.308*** (0.444)
Google _{ct}			-0.273*** (0.083)	
Material _{ct} × Google _{ct}			-0.721* (0.401)	
Awareness _{hc} × Google _{ct}			-0.080 (0.118)	-0.172* (0.096)
Food Inflation _{ct}	0.599*** (0.192)		0.721*** (0.194)	
Energy Inflation _{ct}	0.224*** (0.025)		0.153*** (0.025)	
Core Inflation _{ct}	1.772*** (0.444)		2.194*** (0.352)	
Perceived (realized) Inflation _{hct}		0.849*** (0.056)		0.841*** (0.060)
Observations	122,096	122,096	102,551	103,088
R-squared	0.536	0.554	0.543	0.556
Other constraints	✓		✓	
Household FE	✓	✓	✓	✓
Time FE	✓		✓	
Country-time FE		✓		✓

Table 4: Supply chain constraint pass-through to household inflation expectations: Interactions with household characteristics. This table presents estimation results from Specification (2). The subscript notation is defined as follows: h is a household, c is a country, and t is a quarter. The dependent variable is a household-time-level dummy equal to one if household h believes prices will increase a lot over the next 12 months. Columns (1) and (3) include non-reported controls for the other perceived constraints to production ($Labor_{ct}$, $Financial_{ct}$, $Equipment_{ct}$, and $Other_{ct}$). $Material_{ct}$, $Labor_{ct}$, $Financial_{ct}$, $Equipment_{ct}$, and $Other_{ct}$ measure the share of firms that indicate that their production is constrained by the respective constraint. $Awareness_{hc}$ is a dummy equal to one for households with an above median within household correlation between realized inflation over the last 12 months and the household’s inflation estimate for the last 12 months. $Google_{ct}$ is a country-time level variable measuring the intensity of Google searches for “delays in shipping” (in the respective country’s language). $Food\ Inflation_{ct}$, $Energy\ Inflation_{ct}$, and $Core\ Inflation_{ct}$ are the country-time level CPI for food, energy, and core, respectively. $Perceived\ (realized)\ Inflation_{hct}$ is household h ’s perception about the inflation over the last 12 months. Standard errors are clustered at the country-income-group level and are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

1 The coefficient for $Material_{ct} \times Awareness_{hc}$ in Column (1) of Table 4 shows that house-
2 holds more aware of realized inflation during the initial cost-push phase of the COVID-19
3 supply shock expect a more significant increase in CPI growth in response to escalating
4 supply chain constraints. Column (2) confirms this result for a specification in which we ad-
5 ditionally control for country-quarter fixed effects, which account for other country-specific

factors influencing household inflation expectations, including realized inflation.

Finally, Columns (3) and (4) report results for specifications including interaction terms of $Material_{ct}$ jointly with both $Awareness_{hc}$ and $Google_{ct}$. The coefficients show that households with high awareness about realized inflation during the initial cost-push phase expect even higher future inflation rates in response to supply chain shocks in countries where households are more exposed to and actively acquire information about these disruptions.¹⁹

This pattern is consistent with a news channel in which information about supply chain disruptions feeds into inflation expectations. It also aligns with evidence that more cognitively sophisticated consumers form more extrapolative beliefs (D’Acunto et al., 2023) and that consumers who are more attentive to and informed about realized inflation hold inflation expectations that deviate more strongly upward from professional forecasts than those of less attentive individuals (Link et al., 2024). Moreover, it is consistent with recent research showing an increase in the degree of attention and awareness about the aggregate price level for higher levels of inflation (Cavallo et al., 2017; Bracha and Tang, 2025; Korenok et al., 2022; Pfäuti, 2022; Weber et al., 2025).

Taken together, our findings support the view that post-COVID supply chain pressures pushed household inflation expectations upward.

Country-quarter level analysis. In the final set of tests, we confirm the positive association between supply chain constraints and household inflation expectations using BCS consumer survey data, which covers all EU member countries, and estimate the following *country-quarter level* specification:

¹⁹Table OA.2 shows that the results from Table 4 are robust to including interaction terms between the variable $Awareness_{hc}$ and the different inflation categories (namely, food, energy, and core inflation), as well as perceived inflation.

$$\begin{aligned}\hat{\pi}_{ct}^e = & \beta_1 \textit{Material}_{ct} + \beta_2 \textit{Food Inflation}_{ct} + \beta_3 \textit{Energy Inflation}_{ct} + \beta_4 \textit{Core Inflation}_{ct} \\ & + \textit{Other Constraints}_{ct} + \mu_c + \nu_t + \epsilon_{ct}\end{aligned}\tag{3}$$

Here, the dependent variable is the share of households in country c that believe consumer prices will increase more rapidly. As in the previous tests, we control for other perceived production constraints as well as for realized inflation components, or, alternatively, for households' perceptions of past inflation.

Columns (1) and (2) of [Table OA.3](#) confirm a positive association between supply chain disruptions and household inflation expectations, while Columns (3) and (4) report IV estimates that also corroborate a positive and plausibly causal effect.

4 Generalization into broad-based inflation

In this section, we examine whether higher household inflation expectations are associated with a lower price elasticity of demand, enabling firms to hide behind aggregate cost and price uncertainty and, in turn, sustain higher markups without risking substantial sales losses. This dynamic may allow even firms not directly affected by supply-side constraints to raise prices, thereby contributing to the broader generalization of inflation.

Inflation and expectations across countries. We start by discussing how the initial cost-push shock and the subsequent generalization of inflation vary across countries. Our sample countries differ markedly in their historical inflation experiences and sectoral composition. On the one hand, inflation histories have varied across European countries, both because of rare but extreme hyperinflation episodes and because of more persistent differences in long-run inflation. These historical experiences continue to shape households' inflation expectations today ([Malmendier and Nagel, 2016](#)). On the other hand, countries

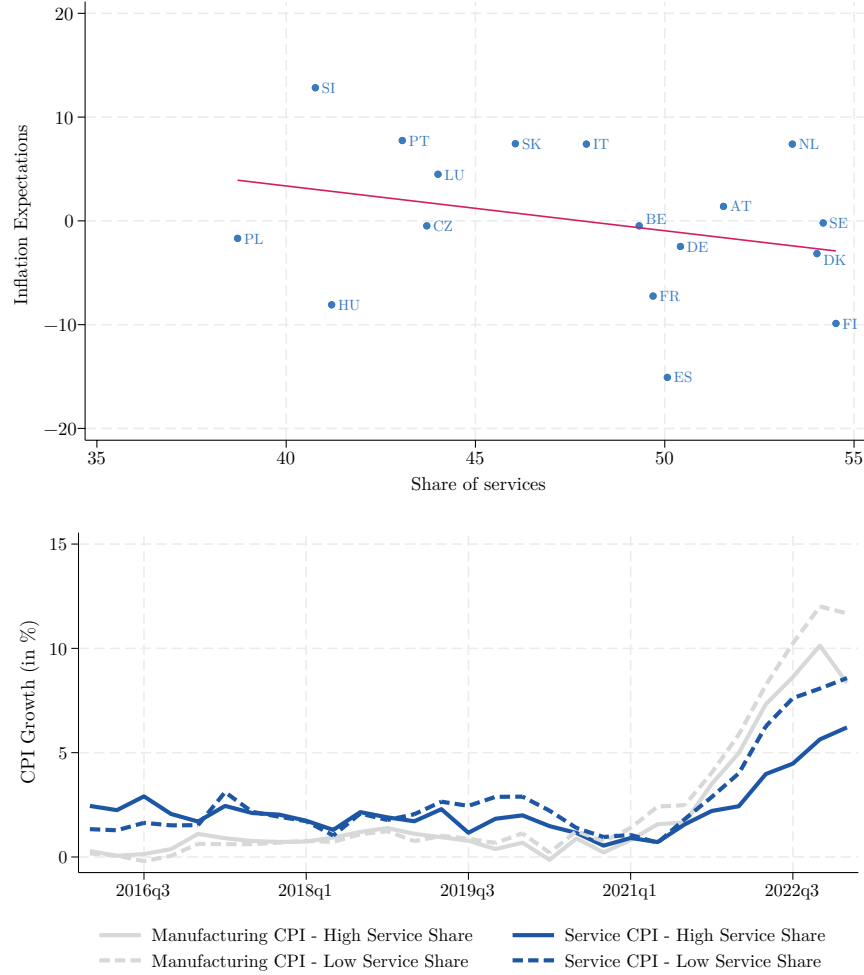


Figure 5: Realized inflation and inflation expectations across countries. The top panel shows the relationship between the standardized residuals from a regression of household inflation expectations in 2022 on employment growth, GDP growth, realized inflation, and GDP level, and the standardized residuals from a regression of the share of household consumption produced by the service sector on the same controls. The bottom panel shows realized manufacturing and service CPIs for countries with a high vs. low share of household consumption produced by the service sector.

1 with manufacturing-intensive economies are more exposed to cost-push shocks, potentially
2 generating persistent cross-country heterogeneity in the formation of inflation beliefs.

3 The top panel of [Figure 5](#) documents that household inflation expectations remain nega-
4 tively associated with the service share of consumption after residualizing both variables with
5 respect to GDP level and growth, realized inflation, and employment growth. This residu-
6 alized relationship mirrors the estimation in [Table OA.4](#) and shows that the cross-country

pattern is not driven by richer or faster-growing countries having larger service sectors. The bottom panel of [Figure 5](#) shows realized manufacturing and services CPI inflation for countries where services account for a high versus low share of household consumption, documenting that higher services inflation is not limited to more service-oriented economies, but also arises in countries where services account for a relatively low share of household consumption and manufacturing plays a larger role.

Taken together, this non-parametric evidence is consistent with an economy more dependent on manufacturing experiencing a larger initial cost-push shock, which then sets in motion the second-order generalization into overall inflation expectations, ultimately affecting service inflation. At the same time, the cross-country variation in post-pandemic inflation expectations does not map cleanly into countries’ historical inflation records, suggesting that the average level of inflation expectations (or the expectations formation more generally) in the post-pandemic period is not entirely driven by past inflation experience.

Baseline generalization analysis. To analyze the generalization into broad-based inflation, we compare the CPI growth in product-country pairs (hereafter termed “markets”) not materially affected by supply chain disruptions, across countries with varying degrees of aggregate (country-time-level) growth in inflation expectations. Specifically, we isolate the impact on CPI growth of service-based products, which were largely unaffected by supply chain constraints during the pandemic, across countries with varying inflation expectations. To this end, we estimate the following “generalization specification”:

$$\begin{aligned}
\Delta CPI_{pct+1} = & \sum_{\tau=20,21,22} \beta_{1\tau} Service_{pc} \times Year_{\tau} \\
& + \sum_{\tau=20,21,22} \beta_{2\tau} Service_{pc} \times High\ Infl\ Exp_c \times Year_{\tau} \\
& + Controls + \mu_{pc} + \nu_{ct} + \xi_{pt} + \epsilon_{pct},
\end{aligned} \tag{4}$$

where p is a product, c is a country, and t is a quarter. The dependent variable is again the one-quarter-ahead CPI growth for a product-country pair, and $Year$ is a set of dummy variables equal to one in 2020, 2021, and 2022, respectively, where the year dummy for 2020 equals one for Q2–Q4 only (i.e., only after the COVID-19 outbreak). We use 2019 as our “base” year. $Service_{pc}$ measures how service-intensive the consumption of product p is in country c . It is defined as the share of total final consumption of product p in country c provided by service industries, and therefore takes values between 0 (no service input) and 1 (entirely service-based).²⁰ Specifically, using the COICOP-CPA bridging matrix from Cai and Vandyck (2020), we compute for each product-country pair the contribution-weighted share of these service industries in the total consumption of product p . $High\ Infl\ Exp_c$ is an indicator equal to one if the increase in the share of households expecting prices to rise more rapidly is above the median in a country between 2021:Q1 and 2022:Q1, the period during which household inflation expectations rose substantially in Europe (see Figure 4). Figure OA.5 shows that in countries with high inflation expectations, the distribution of the growth in the share of households expecting prices to rise more rapidly has a notably thicker right tail, indicating a larger share anticipating steep price increases.

We again also include product-country, country-time, and product-time fixed effects, as well as the following set of control variables: the other constraints to production ($Labor_{pct}$, $Financial_{pct}$, $Equipment_{pct}$, and $Other_{pct}$) interacted with the three post-COVID year dummies, and $Energy\ Inflation_{ct}$ interacted with the $Service_{pc}$ variable and the three year dummies. Finally, we exclude the product “Energy” from the sample. Controlling for the $Energy\ Inflation_{ct}$ interactions and excluding the product “Energy” alleviates concerns about bias coming from the rise in energy inflation during our sample period—due to the manifestation

²⁰We use the BCS classification to identify service industries in the CPA taxonomy.

	(1)	(2)	(3)	(4)	(5)	(6)
	ΔCPI_{pct+1}	$\Delta\text{Volume}_{pct+1}$	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}
Specification	Full Sample Baseline	Full Sample Baseline	Demand 1-Digit	Lockdown Intensity	Household Expenditure	Realized Inflation
$\text{Service}_{pc} \times 2020_t$	-0.871 (0.725)	0.028 (0.171)	-1.483* (0.754)	-0.871 (0.738)	-0.880 (0.730)	-0.903 (0.701)
$\text{Service}_{pc} \times 2021_t$	-1.338** (0.524)	-0.011 (0.050)	-1.520** (0.653)	-1.366** (0.536)	-1.335** (0.527)	-1.667*** (0.565)
$\text{Service}_{pc} \times 2022_t$	-1.594** (0.730)	-0.046 (0.065)	-2.625*** (0.548)	-1.522* (0.768)	-1.580** (0.723)	-1.882* (0.980)
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2020_t$	0.618 (0.642)	0.104 (0.084)	0.805 (1.026)	0.553 (0.612)	0.623 (0.640)	0.661 (0.657)
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2021_t$	0.519 (0.380)	0.044 (0.032)	0.674 (0.457)	0.392 (0.359)	0.529 (0.380)	0.618 (0.366)
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2022_t$	0.766** (0.321)	0.012 (0.026)	0.976* (0.521)	0.840** (0.329)	0.781** (0.324)	0.736* (0.370)
$\text{Service}_{pc} \times \text{Energy Inflation}_{ct} \times 2020_t$	0.042 (0.054)	0.010 (0.015)	0.134 (0.086)	0.044 (0.053)	0.042 (0.054)	0.069 (0.050)
$\text{Service}_{pc} \times \text{Energy Inflation}_{ct} \times 2021_t$	0.057* (0.028)	0.012* (0.007)	0.042 (0.025)	0.048 (0.030)	0.057* (0.028)	0.049* (0.026)
$\text{Service}_{pc} \times \text{Energy Inflation}_{ct} \times 2022_t$	0.043* (0.024)	0.010* (0.005)	0.053* (0.029)	0.041 (0.024)	0.043* (0.024)	0.038 (0.024)
$\text{Service}_{pc} \times \text{Energy Inflation}_{ct}$	-0.034 (0.023)	-0.009* (0.005)	-0.045 (0.027)	-0.031 (0.024)	-0.034 (0.023)	-0.034 (0.023)
$\text{Energy Use}_{pc} \times \text{Energy Inflation}_{ct}$	0.010 (0.070)	0.008 (0.005)	-0.184** (0.078)	0.013 (0.070)	0.011 (0.071)	0.011 (0.070)
Observations	8,518	8,023	7,681	8,518	8,518	8,518
R-squared	0.589	0.609	0.785	0.590	0.589	0.591
Constraints	✓	✓	✓	✓	✓	✓
Lockdown intensity control				✓		
Household expenditure control					✓	
Country-time FE	✓	✓		✓	✓	✓
Product-country FE	✓	✓	✓	✓	✓	✓
Product-time FE	✓	✓	✓	✓	✓	✓
1-digit product-country-time FE			✓			
Realized inflation controls						✓

Table 5: Pass-through of supply chain constraints to generalized inflation: Price and volume responses and demand-side controls. This table presents estimation results from Specification (4). The subscript notation is defined as follows: p is a product, c is a country, and t is a quarter. The dependent variable is the one-quarter-ahead CPI growth at the product-country level in Columns (1) and (3)–(6), and the one-quarter-ahead growth in Eurostat’s price-adjusted production-volume index in Column (2). Non-reported controls include the other perceived constraints to production ($Labor_{pct}$, $Financial_{pct}$, $Equipment_{pct}$, and $Other_{pct}$) uninteracted and, in addition, interacted with the three post-COVID year dummies. $Labor_{pct}$, $Financial_{pct}$, $Equipment_{pct}$, and $Other_{pct}$ measure the share of firms that indicate that their production is constrained by the respective constraint. $Service_{pc}$ is the time-invariant contribution of service sectors to the consumption of product p in country c . $High\ Infl\ Exp_c$ is an indicator equal to one if the increase in the share of households expecting that prices will rise more rapidly is above the median in a country between 2021:Q1 and 2022:Q1. $Energy\ Inflation_{ct}$ is the country-time-level CPI for energy. $Energy\ Use_{pc}$ is a product-country pair’s energy input before the COVID-19 pandemic, measured in 2019 and scaled by the country’s total energy use. In Column (3), we include product-country-time fixed effects using the 1-digit COICOP as the product category. In Column (4), we additionally control for the country-level severity of lockdown measures in 2021, as well as for its double and triple interactions with $Service_{pc}$ and the year dummies. In Column (5), we additionally control for households’ final consumption expenditure at the product-country-time level. In Column (6), we additionally control for the country-time-level CPIs for food and core, as well as their interactions with $Service_{pc}$ and the three post-COVID year dummies. We exclude the product “Energy” from the regression. Standard errors in parentheses are clustered at the country level using the “LZ2” bias-reduction modification of Imbens and Kolesar (2016). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

- 1 of pent-up demand in 2021 and notably after the Russian invasion of Ukraine in March 2022,
- 2 which severely affected energy supply to several European countries.

The estimation results in Table 5 are consistent with inflation spreading from markets directly affected by supply-side constraints to more service-oriented markets. These markets were less affected, or not affected at all, by the constraints. In line with supply chain disruptions feeding into consumer prices primarily through manufacturing, the first three rows of Column (1) show that more service-oriented markets exhibit lower CPI growth than more manufacturing-based markets within the same country in each post-COVID year. Moreover, the corresponding double interaction becomes increasingly negative over time, suggesting that in countries with more anchored expectations, the inflation gap between manufacturing- and service-oriented markets tends to widen. The positive and significant coefficient on $Service_{pc} \times High\ Infl\ Exp_c \times 2022_t$ indicates that this widening is substantially attenuated in countries where inflation expectations rose strongly (though the combined 2022 effect remains negative, so manufacturing inflation still exceeds service inflation). Consistent with this catch-up in price increases among service-sector firms relative to manufacturing firms, Figure OA.6 shows that while the gap between service and manufacturing inflation initially widened after 2020, it narrowed more toward 2022 in high-inflation-expectation countries than in countries with more anchored expectations.

Finally, the coefficients for $Service_{pc} \times Energy\ Inflation_{ct}$ interacted with the three post-COVID years in Column (1) of Table 5 indicate that energy prices do not seem to substantially affect the differential CPI growth rates between service- and manufacturing-oriented markets. This observation implies that energy prices are unlikely to be the driver of the generalization of inflation that we are documenting.

A potential alternative channel is that inflation expectations contain rational, forward-looking information about future price increases. Under this interpretation, our results would not reflect households becoming less price-sensitive after attributing higher prices to broad market-wide cost increases. Instead, expectations would proxy for unobserved conditions that disproportionately raise future service prices. Because country-quarter fixed effects absorb aggregate inflation and other country-wide shocks, this alternative requires expect-

tations to contain sector-specific forecasting content. The subsequent catch-up in service prices would then reflect this forecasting content rather than a perception-induced decline in demand elasticity.

To provide evidence that helps distinguish between these channels, we examine the quantity response associated with the catch-up in service prices. A rational-forecasting explanation does not, by itself, imply that firms can raise relative prices without a corresponding decline in relative quantities. By contrast, the demand-elasticity channel predicts that, when households attribute higher prices to broader market-wide cost increases, their price sensitivity declines, and the quantity response to an increase in service prices should therefore be muted. We test this implication by re-estimating the baseline spillover specification in Column (2) of [Table 5](#), replacing one-quarter-ahead CPI growth with one-quarter-ahead growth in the price-adjusted production-volume index from Eurostat. Although the service-manufacturing price gap narrowed more in countries with high inflation expectations in 2022, we find no statistically significant differential change in the service-manufacturing production-volume gap.

To further assess the demand-elasticity channel, we use an annual measure from Eurostat of the share of individuals searching online for information about goods and services and compare, for each country, pre-COVID search with post-COVID search. [Table OA.5](#) in the Online Appendix shows that post-COVID shopping-related online search declined more relative to its pre-COVID trend in high-inflation-expectation countries than in low-inflation-expectation countries.²¹ Lower shopping-related search is consistent with a decline in the expected return to searching for cheaper alternatives, which is the behavioral margin emphasized by the demand-elasticity channel.

²¹The analysis is restricted to the 13 countries for which the Eurostat search series is continuously available without a series break.

1 Taken jointly, the stronger narrowing of the service–manufacturing price gap, the small
2 and statistically insignificant corresponding differential change in production volumes, and
3 the larger decline in online information seeking in high-inflation-expectation countries are
4 consistent with a reduction in the price elasticity of demand faced by firms. However, we can-
5 not rule out that inflation expectations also contain information about future sector-specific
6 conditions. Rational expectations and the demand-elasticity channel are not mutually ex-
7 clusive: expectations may contain information about future inflation while also changing
8 how households interpret current price increases. If households expect price increases to be
9 broad-based, the expected return to search falls and price sensitivity declines.

10 **Demand shocks and expectations vs. realized inflation.** In Columns (3)–(5) of [Table](#)
11 [5](#), we conduct three tests to mitigate the concern that the generalization of inflation is merely
12 a result of demand shocks. In Column (3), we include product-country-time fixed effects,
13 using the 1-digit COICOP as product category. These fixed effects control for the impact
14 of demand shocks affecting broad product categories. In Column (4), we further control
15 for the country-level severity of lockdown measures in 2021 (using OxCGRT’s COVID-19
16 Stringency Index) as a proxy for pent-up demand for services.²² Moreover, in Column (5),
17 we control for the final consumption expenditure of households at the product-country-
18 time level, employing data from Eurostat at the 2-digit COICOP level. This variable helps
19 control for changes in the composition of household demand across product categories within
20 countries over time. The spillover of inflation to services sectors in high inflation expectation
21 countries is not materially affected when we control for these proxies of demand.

22 To further sharpen the interpretation of our inflation generalization results, we account for
23 all components of contemporaneous realized inflation in Column (6). Incorporating realized-

²²[Table OA.6](#) reports an expanded version of [Table 5](#), additionally displaying the full set of interaction terms involving the demand-side control variables.

inflation controls ensures that cross-country differences in service-sector price dynamics reflect differences in how broad-based and persistent inflationary pressures are perceived, rather than simply the fact that some countries experienced higher inflation. Accordingly, we augment the spillover specification by controlling for realized inflation (decomposed into core, energy, and food components) interacted with $Service_{pc}$ and the three post-COVID year dummies.

Reassuringly, the core result remains: service-sector prices increase more strongly in high-expectation countries even after conditioning on realized inflation. This evidence indicates that the relevant cross-country variation is not driven by high realized inflation per se, but is consistent with a perceived shift toward a broad-based and persistent inflation regime.

Controlling for spillovers along the supply chain. Another potential concern is that the observed generalization of inflation from markets directly affected by supply-side constraints to those less impacted is, at least partially, driven by spillover effects along the supply chain. Specifically, disruptions in upstream production could cascade downstream, influencing the prices of final goods sold to consumers. This dynamic might bias our results if more service-oriented product-country pairs are initially less affected by supply-side shocks in the early post-COVID period, yet are indirectly affected later due to their reliance on upstream suppliers that experience these shocks.

To assess this mechanism, we include two additional controls for upstream shocks. *Material Supply_{pcx}* captures the share of suppliers facing material shortages in year x among those supplying firms that sell product p in country c in year t . *Energy Use Supply_{pc}* $\times$ *Energy Inflation_{cx}* captures the impact of rising energy costs on suppliers and equals the product of their pre-shock energy use and energy-price growth. Specifically, we calculate these controls as:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta \text{CPI}_{pct+1}$	$\Delta \text{CPI}_{pct+1}$	$\Delta \text{CPI}_{pct+1}$	$\Delta \text{CPI}_{pct+1}$	$\Delta \text{CPI}_{pct+1}$	$\Delta \text{CPI}_{pct+1}$	$\Delta \text{CPI}_{pct+1}$
Specification	Supply t Spillover	Supply $t-1$ Spillover	Supply $t-2$ Spillover	Wage Level	2-year Wage Growth	1-year Wage Growth	Labor Intensity
Service _{pc} × 2020 _t	−0.702 (0.835)	−0.706 (0.876)	−0.696 (0.916)	−2.711 (1.738)	−0.042 (0.924)	−0.133 (0.878)	−0.858 (0.730)
Service _{pc} × 2021 _t	−1.448** (0.551)	−1.331** (0.561)	−1.219** (0.517)	−2.911* (1.600)	−1.090** (0.493)	−1.082* (0.547)	−1.345** (0.528)
Service _{pc} × 2022 _t	−1.746* (0.868)	−1.825* (0.882)	−1.753* (0.890)	−2.353 (1.451)	−1.382* (0.725)	−1.479* (0.824)	−1.582** (0.709)
Service _{pc} × High Infl Exp _c × 2020 _t	0.591 (0.631)	0.595 (0.618)	0.572 (0.635)	0.897 (0.739)	0.604 (0.519)	0.497 (0.483)	0.633 (0.648)
Service _{pc} × High Infl Exp _c × 2021 _t	0.503 (0.381)	0.505 (0.370)	0.491 (0.387)	0.660 (0.392)	0.596 (0.355)	0.495 (0.416)	0.521 (0.380)
Service _{pc} × High Infl Exp _c × 2022 _t	0.775** (0.338)	0.796** (0.322)	0.780** (0.334)	0.803** (0.363)	0.818** (0.314)	0.732** (0.342)	0.792** (0.338)
Observations	8,518	8,518	8,518	8,502	8,518	8,518	8,518
R-squared	0.589	0.589	0.589	0.590	0.590	0.591	0.589
Constraints	✓	✓	✓	✓	✓	✓	✓
Wage level control				✓			
Wage growth control					✓	✓	
Labor intensity control							✓
Country-time FE	✓	✓	✓	✓	✓	✓	✓
Product-country FE	✓	✓	✓	✓	✓	✓	✓
Product-time FE	✓	✓	✓	✓	✓	✓	✓

Table 6: Pass-through of supply chain constraints to generalized inflation: Supply-side controls. This table presents estimation results from Specification (4). The subscript notation is defined as follows: p is a product, c is a country, and t is a quarter. The dependent variable is the one-quarter-ahead CPI growth at the product-country level. Non-reported controls include the other perceived constraints to production ($Labor_{pct}$, $Financial_{pct}$, $Equipment_{pct}$, and $Other_{pct}$) uninteracted and, in addition, interacted with the three post-COVID year dummies. Moreover, we control for the country-time level CPI for energy ($Energy\ Inflation_{ct}$) interacted with the $Service_{pc}$ variable and the three year dummies, as well as $Energy\ Use_{pc} \times Energy\ Inflation_{ct}$. $Labor_{pct}$, $Financial_{pct}$, $Equipment_{pct}$, and $Other_{pct}$ measure the share of firms that indicate that their production is constrained by the respective constraint. $Energy\ Inflation_{ct}$ is the country-time level CPI for energy. $Energy\ Use_{pc}$ is a product-country pair’s energy input before the COVID-19 pandemic, measured in 2019 and scaled by the country’s total energy use. We exclude the product “Energy” from the regression. $Service_{pc}$ is the time-invariant contribution of service sectors to the consumption of product p in country c . $High\ Infl\ Exp_c$ is an indicator equal to one if the increase in the share of households expecting that prices will rise more rapidly is above the median in a country between 2021:Q1 and 2022:Q1. Columns (1)–(3) introduce interactions with $Material\ Supply_{pcx}$, which measures the share of firms that indicate that their production is constrained by material input constraints in year $x = t$ among the suppliers that provide input goods to firms that sell product p in country c in year t . Columns (1)–(3) also include controls for the energy cost exposure in year x of the suppliers that provide input goods to firms that sell product p in country c in year t . We set $x = t$ in Column (1) to capture contemporaneous spillovers, and to $x = t-1$ and $x = t-2$ in Columns (2) and (3), respectively, to allow for lagged transmission along the supply chain. In Columns (4)–(7), we additionally control for (i) the product-country-time level wage (Column (4)), (ii) the product-country level wage growth over the last two years and the growth over the next two years (Column (5)), (iii) the product-country level wage growth over the last year and the growth over the next year (Column (6)), and (iv) the pre-COVID industry-country level capital–labor intensity, measured as real capital over labor cost (Column (7)), as well as their respective interactions with $Service_{pc}$ and the three post-COVID year dummies. Standard errors in parentheses are clustered at the country level using the “LZ2” bias-reduction modification of [Imbens and Kolesar \(2016\)](#). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

$$Supplier\ Constraint_{pcx} =$$

$$\sum_{\bar{j}, \bar{c}} \left[COICOP\ Share_{pc\bar{j}} \times Consumption\ Share_{c\bar{j}\bar{c}} \times \left(\sum_{\underline{j}, \underline{c}} Supply\ Share_{\bar{j}\underline{c}\underline{c}} \times Constraint_{\underline{j}\underline{c}\underline{c}} \right) \right],$$

where *Constraint* is either $Material_{j\bar{c}x}$ or $Energy\ Use\ Supply_{j\bar{c}} \times Energy\ Inflation_{\bar{c}x}$. Indices $\bar{j}$ and $\bar{c}$ denote the customer industry and country, while j and c denote the supplier industry and country. $COICOP\ Share_{pc\bar{j}}$ refers to the weight of CPA categories linked to a given COICOP category, and $Consumption\ Share_{c\bar{j}\bar{c}}$ reflects the contribution of these CPA categories to final consumption.

Columns (1)–(3) of Table 6 present the results of this robustness test: Column (1) includes contemporaneous controls ($x = t$), while Columns (2) and (3) incorporate one-quarter-lagged and two-quarter-lagged values ($x = t - 1$ and $x = t - 2$), respectively, to account for potential delays in the transmission of supply shocks through the supply chain. The results show that the inflation generalization effect on the services sector remains robust even after controlling for supply chain spillovers.

Testing for the influence of labor costs. A related alternative mechanism is that higher prices in service-intensive markets in countries with rapidly rising inflation expectations reflect firms’ anticipation of steeper labor-cost growth, as heightened household inflation expectations may translate into stronger wage demands (e.g., Reis, 2023).

We assess this wage-cost channel in three complementary ways. First, we use compensation data from Eurostat and augment our generalization specification with controls for the contemporaneous wage level (Column (4) of Table 6) and, alternatively, wage growth measured over a 2-year backward- and forward-looking window (Column (5)), or over a 1-year backward- and forward-looking window (Column (6)).²³ The backward-looking component absorbs recent realized wage pressure and wage momentum, while the forward-looking component assesses whether our results are picking up wage pressures that materialize only

²³We observe compensation at the industry-country-time level. As with our other industry-country variables, we map it to the product-country level using an input-output table and industry shares in final household consumption for each product. Table OA.7 reports an expanded version of Table 6, additionally displaying the full set of interaction terms involving the supply-side control variables.

subsequently, consistent with firms anticipating higher future labor costs. We also interact the wage controls with $Service_{pc}$ and the three post-COVID year dummies to allow the relationship between labor costs and prices to vary with service intensity and over time. If the generalization effect were primarily driven by higher labor costs (because inflation raises wage demands and firms respond by increasing prices), then conditioning on wages should materially attenuate the estimated 2022 generalization effect; that is, the differential 2022 inflation response in more service-intensive markets in high-expectation countries. However, the estimated generalization effect is robust to these additions: both its magnitude and statistical significance remain very close to the baseline.

Second, we control for the pre-COVID capital-labor intensity (Column (7) of Table 6), measured as real capital over labor costs and taken from the 9th vintage of the CompNet database, again interacted with $Service_{pc}$ and the three post-COVID year dummies.²⁴ This addresses the possibility that stronger wage pressures, particularly relevant in labor-intensive service activities, drive the differential increase in prices of service-intensive goods in high-expectation countries. Again, the estimated generalization effect remains quantitatively similar when this control is added.

Third, we use the OECD/AIAS ICTWSS database, which reports an adjusted collective bargaining coverage rate, and re-estimate Specification (4) separately for high-coverage countries (coverage above 75%) and low-coverage countries (coverage below 75%).²⁵ Columns (1) and (2) of Table 7 show that, while the 2022 interaction is positive and statistically sig-

²⁴We again map this variable from the industry-country level to the product-country level using an input-output table and industry shares in final household consumption for each product.

²⁵The adjusted collective bargaining coverage rate is defined as the number of employees covered by a collective agreement in force as a proportion of the total number of employees minus the number of employees legally excluded from the right to bargain. We set the threshold for the sample split to 75% since the distribution of the collective bargaining coverage rate across countries is clustered into two distinct groups, as shown in Figure OA.7: countries that all have a coverage ratio below 57% and countries that all have a coverage ratio above 77%.

	(1)	(2)	(3)	(4)
	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}
Sample	High Bargaining Countries	Low Bargaining Countries	High Mkt Power Markets	Low Mkt Power Markets
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2020_t$	0.251 (0.812)	0.302 (0.574)	1.406 (0.817)	-0.411 (1.519)
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2021_t$	-0.165 (0.365)	0.084 (0.648)	0.438 (0.481)	0.236 (0.765)
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2022_t$	0.551* (0.254)	1.104* (0.457)	0.842** (0.377)	-0.418 (0.605)
Observations	5,046	2,976	3,456	3,510
R-squared	0.673	0.599	0.632	0.725
Other constraints	✓	✓	✓	✓
Country-time FE	✓	✓	✓	✓
Product-time FE	✓	✓	✓	✓
Product-country FE	✓	✓	✓	✓

Table 7: Pass-through of supply chain constraints to generalized inflation: Sample splits. This table presents estimation results from Specification (4), estimating Column (1) of Table 5 in subsamples. The subscript notation is defined as follows: p is a product, c is a country, and t is a quarter. The dependent variable is the one-quarter-ahead CPI growth at the product-country level. Non-reported controls include the other perceived constraints to production (Labor_{pct} , Financial_{pct} , Equipment_{pct} , and Other_{pct}) uninteracted and, in addition, interacted with the three post-COVID year dummies. Moreover, we control for the country-time level CPI for energy ($\text{Energy Inflation}_{ct}$) interacted with the Service_{pc} variable and the three year dummies, as well as $\text{Energy Use}_{pc} \times \text{Energy Inflation}_{ct}$. Labor_{pct} , Financial_{pct} , Equipment_{pct} , and Other_{pct} measure the share of firms that indicate that their production is constrained by the respective constraint. $\text{Energy Inflation}_{ct}$ is the country-time level CPI for energy. Energy Use_{pc} is a product-country pair’s energy input before the COVID-19 pandemic, measured in 2019 and scaled by the country’s total energy use. We exclude the product “Energy” from the regression. Service_{pc} is the time-invariant contribution of service sectors to the consumption of product p in country c . High Infl Exp_c is an indicator equal to one if the increase in the share of households expecting that prices will rise more rapidly is above the median in a country between 2021:Q1 and 2022:Q1. High Bargaining countries are countries with a share of employees covered by a collective agreement as a proportion of the number of eligible employees above 75%. High Market Power markets are defined as product-country pairs with an above median average markup. Standard errors in parentheses are clustered at the country level using the “LZ2” bias-reduction modification of Imbens and Kolesar (2016). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

nificant in both subsamples, the point estimate is larger in low-coverage countries than in high-coverage countries. We interpret this split as suggestive evidence against a wage-cost explanation driven by coordinated wage setting: if wage pressures operating through centralized bargaining were the dominant driver, one would expect a stronger relationship in high-coverage countries.

Our evidence is consistent with recent micro-level work on the wage channel, which finds that the pass-through from inflation expectations to wage growth is quantitatively limited (e.g., Buchheim et al., 2024; Gautier et al., 2025) and therefore unlikely to be the primary driver of the cross-country differences in service-sector price levels that we document.

Influence of market power. Finally, we examine whether the generalization of inflation is linked to firms’ pricing power. Columns (3) and (4) of Table 7 show estimation results in the subsamples of *High Market Power* and *Low Market Power* markets, which consist of product-country pairs with an above and below median average markup in 2018, respectively (average markups are from the 9th vintage of the CompNet database). The results indicate that the generalization into broad-based inflation is driven by markets with high market power, consistent with service firms using their pricing power to sustain higher markups in an environment in which inflation is perceived to be broad-based and persistent—thereby facilitating the broader diffusion of inflationary pressures.

Taken together, our evidence is consistent with inflation initially driven by supply-side shocks becoming increasingly broad-based over time, shifting from manufacturing to services, as firms leverage their pricing power in an environment where inflation is increasingly viewed as pervasive.

5 The role of firms’ pricing behavior

In this section, we employ two sets of tests to further examine the role of firms’ pricing behavior in the generalization of inflationary pressures and how such generalization is shaped by household inflation expectations, firms’ pricing power, and their interaction.

In Section 5.1, we use firm-level financial data for publicly listed firms from Compustat Global and earnings call transcripts analyzed with a LLM to link elevated household inflation expectations to firms’ ability to sustain higher markups through increased pricing power. As outlined in Section 2.3, elevated household inflation expectations can result in lower price elasticity of demand, as evidenced by references to increased pricing power and resilient demand in company earnings call transcripts. In Section 5.2, we analyze how firms’ pre-COVID pricing power interacts with elevated household inflation expectations during the pandemic to shape their pricing and markup behavior, using data from Compustat Global

and Bureau van Dijk’s Orbis, which provides extensive coverage of both publicly listed and privately held firms.

5.1 Drivers of firms’ pricing behavior and pricing power

To assess firms’ pricing behavior in the post-COVID inflationary environment, we leverage Compustat Global data and estimate firm markups following Loecker and Warzynski (2012) (see Section OA.1 for details). Their approach relies on the insight that the output elasticity of a variable production factor is only equal to its expenditure share in total revenue when the price equals the marginal cost of production. Under any form of imperfect competition, however, the relevant markup drives a wedge between the input’s revenue share and its output elasticity.

To explore the factors influencing firms’ pricing behavior, we analyze transcripts of companies’ earnings calls, which are key events where executives provide insights into a firm’s financial health, future outlook, and—most importantly for our analysis—strategic decisions, including pricing policies. We obtain earnings call transcripts from the LSEG Workspace Transcripts & Briefs database. Our sample includes 27,163 transcripts from 2,414 European firms, covering all quarters from 2019:Q1 to 2023:Q4. Each transcript consists of a presentation by company executives, followed by a Q&A session with analysts. To ensure consistency, we retain only the presentation portion, as it follows a standardized format across firms and focuses on comparable company-specific topics. We further segment each transcript by speaker to reduce the LLM input length and analyze patterns within a call. The total number of speaker sections across all transcripts is 120,305, resulting in an average of 4.43 speaker sections per transcript.

We employ an LLM to identify whether firms discuss price increases and the factors driving them, leveraging the model’s ability to process large volumes of textual data while

preserving context and capturing relationships within the text (Vaswani et al., 2017).²⁶ Specifically, we use OpenAI’s GPT-4o model and interact with it through the ChatCompletion API endpoint.²⁷ To ensure consistent formatting of the model’s output, we specify a structured JavaScript Object Notation (JSON) output schema. Each API request includes the following prompt, along with a speaker section of an earnings call transcript:

You are an economic analyst specializing in extracting nuanced insights from textual data. Your specialization is in understanding firms’ pricing power, input costs and frictions, and customer demand in an inflationary environment. You will be given a section of an earnings call transcript where the dialogue is segmented by speaker. Based only on the text provided, you must assign two scores: score one and score two.

Score one:

- *‘1’ if the company experiences or expects rising pricing power.*
- *‘0’ if the company does not experience or expect rising pricing power.*
- *‘na’ if the company does not discuss its pricing power.*

Score two (one or more values):

- *‘1’ if the company experiences or expects resilient demand.*
- *‘2’ if the company experiences or expects supply-chain disruptions.*
- *‘3’ if the company experiences or expects rising labor costs.*
- *‘4’ if the company experiences or expects rising energy costs.*
- *‘na’ only if none of the other options are assigned.*

The values should only include the score and no additional text.

Based on the output, we construct a set of variables to investigate the mechanisms linking firms’ pricing behavior to elevated household inflation expectations and firms’ pricing power.

²⁶Traditional text analysis techniques, such as keyword extraction, word counting, and rule-based sentiment analysis, struggle to preserve context over long sequences and to capture complex relationships between words.

²⁷We set the temperature to 0 to ensure deterministic behavior, meaning the model will always select the most probable next token in its output. This behavior is preferred for a classification task such as ours.

To capture firms’ general perception of their ability to raise prices, we define the baseline variable *Pricing Power Overall*_{*ijct*} as the number of transcript sections in which executives of firm *i* in industry *j* in country *c* during quarter *t* report experiencing or expecting rising pricing power (i.e., score one equals 1), irrespective of the underlying justification. In line with our hypothesized transmission mechanism that elevated household inflation expectations are associated with lower consumer price sensitivity, mentions of pricing power are significantly more common in countries characterized by higher household inflation expectations.²⁸ Firms in high-expectation countries report a size-adjusted average of 1.04 mentions of pricing power, compared to 0.97 in low-expectation countries, with the difference being statistically significant ($t = 2.66$).

To more directly assess whether firms are able to maintain higher prices without significant losses in sales (indicative of lower demand elasticity), we construct the variable *Pricing Power & Resilient Demand*_{*ijct*}, which counts the number of transcript sections in which executives explicitly link their pricing power to resilient consumer demand, as identified by our LLM classification (i.e., score one equals 1 and score two includes value 1). Consistent with the baseline results, firms in high-expectation countries are significantly more likely to cite resilient demand when discussing pricing power (1.02 vs. 0.92; $t = 3.41$). This pattern reinforces the idea that elevated inflation expectations can support stronger firm pricing power by altering consumer behavior.

Next, we parametrically confirm that pricing power and resilient demand, associated with elevated household inflation expectations and indicative of lower price elasticity of demand, allow firms to charge relatively higher markups. For this analysis, we regress the estimated markup of firm *i* in industry *j* and country *c* in quarter $t + 1$ on our LLM-based pricing

²⁸Recall that high inflation expectation countries are those where the increase in the share of households expecting prices to rise more rapidly between 2021:Q1 and 2022:Q1 is above the median.

power measures in quarter t , controlling for country-quarter fixed effects:

$$Markup_{ijct+1} = \alpha + \beta LLM_{ijct} + \psi_{ct} + \epsilon_{ijct}, \quad (5)$$

where i is a firm, j is an industry, c is a country, and t is a quarter.

Panel A of Table 8 presents the results. Column (1) shows that executives' explicit discussions of pricing power during earnings calls are predictive of increased firm-level markups in the following quarter, thus validating our LLM-based classification. Importantly, in a context where costs are increasing, even simply maintaining the same markup suggests that these firms were able to enhance their gross margins in absolute terms (and consequently, their absolute profits) per unit sold.²⁹ Column (2) shows that firms specifically highlighting resilient demand as a basis for their pricing power are able to charge relatively higher markups, supporting the idea that once elevated household inflation expectations reduce consumers' price sensitivity, firms can leverage this environment to sustain higher markups.

In addition to demand-side drivers, an alternative source of firms' pricing power in the post-COVID period could stem from scarcity-driven factors. Specifically, supply chain bottlenecks, while simultaneously raising input costs, may enhance firms' ability to set higher prices, either directly by reducing competitive pressures from limited product availability or indirectly by elevating consumers' inflation expectations, which firms can more broadly exploit as justification for price increases. To investigate this potential mechanism, we construct the variable *Pricing Power & Supply Chain* _{$ijct$} analogously to *Pricing Power & Resilient Demand* _{$ijct$} . This variable counts the number of transcript sections in which executives explicitly link their pricing power to supply chain disruptions. The results in Column (3)

²⁹Markups are defined as the ratio of price to marginal costs. Take, for instance, an initial markup of 1.5. If marginal costs rise from 1 to 2 due to supply-side shocks, the per-unit gross margin in absolute terms then grows from 0.5 ($= 1.5 \times 1 - 1$) to 1 ($= 1.5 \times 2 - 2$).

Panel A: Baseline	(1)	(2)	(3)	(4)	(5)
	Markup _{ijct+1}	Markup _{ijct+1}	Markup _{ijct+1}	Markup _{ijct+1}	Markup _{ijct+1}
Specification	Overall (X=1)	X=Resilient Demand _{ijct}	X=Supply Chain _{ijct}	X=Labor	X=Energy _{ijct}
Pricing Power _{ijct} & X	0.029* (0.016)	0.034** (0.017)	-0.007 (0.020)	-0.015 (0.030)	-0.070*** (0.027)
Observations	5,992	5,992	5,992	5,992	5,992
R-squared	0.067	0.067	0.065	0.065	0.067

Panel B: Service vs. Manufacturing	(1)	(2)	(3)	(4)	(5)
	Markup _{ijct+1}	Markup _{ijct+1}	Markup _{ijct+1}	Markup _{ijct+1}	Markup _{ijct+1}
Specification	Overall (X=1)	X=Resilient Demand _{ijct}	X=Supply Chain _{ijct}	X=Labor	X=Energy _{ijct}
Pricing Power _{ijct} & X	0.054* (0.032)	0.065** (0.025)	-0.004 (0.041)	-0.037 (0.069)	-0.186** (0.078)
Pricing Power _{ijct} & X × Service _{ijc} × 2020 _t	-0.049 (0.067)	-0.047 (0.039)	-0.037 (0.059)	-0.037 (0.192)	-0.035 (0.211)
Pricing Power _{ijct} & X × Service _{ijc} × 2021 _t	0.048 (0.052)	0.059 (0.042)	0.039 (0.053)	0.174 (0.138)	-0.091 (0.125)
Pricing Power _{ijct} & X × Service _{ijc} × 2022 _t	0.096* (0.050)	0.088*** (0.026)	0.086 (0.059)	0.005 (0.114)	-0.041 (0.117)
Observations	5,992	5,992	5,992	5,992	5,992
R-squared	0.082	0.082	0.083	0.078	0.084

Country-time FE	✓	✓	✓	✓	✓
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Table 8: Drivers of firms' pricing behavior and pricing power. This table presents estimation results from Specification (5). Panel A reports the baseline specification, while Panel B augments it by introducing interaction terms between the dummy variable *Service_{ijc}* and the three post-COVID year dummies. The subscript notation is defined as follows: *i* is a firm, *j* is an industry, *c* is a country, and *t* is a quarter. The dependent variable is a firm's one-quarter-ahead markup. In Column (1), *Pricing Power_{ijct}* is measured as the total number of instances in which a firm discusses having pricing power. In Columns (2) to (5), *Pricing Power_{ijct} & X* is measured based on the number of instances attributed to each specific driver listed in the respective column. *Service_{ijc}* is an indicator variable equal to one if a firm is incorporated in a service sector, and zero otherwise. Standard errors are clustered at the firm level and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

1 indicate that firms citing supply chain frictions alongside pricing power do not exhibit sig-
2 nificantly higher markups, suggesting that supply-side scarcity alone may be a weaker basis
3 for firms to raise prices.

4 Similarly, we examine whether labor and energy constraints influence firms' pricing power
5 in the post-COVID inflationary environment. To this end, we construct the measures *Pric-*
6 *ing Power & Labor_{ijct}* and *Pricing Power & Energy_{ijct}*, which count instances in earnings
7 call transcripts where executives link their pricing power to rising labor costs or elevated
8 energy prices, respectively. Columns (4) and (5) show that references to labor costs have no

significant effect, while energy costs are associated with relatively lower markups, suggesting that rising energy costs pose particular challenges for firms in passing through price increases to consumers.

Finally, we parametrically analyze how firms in the service and manufacturing sectors differ in their ability to sustain higher markups, and whether these differences change over time. For this analysis, we augment Specification (5) by introducing interaction terms with the dummy variable $Service_{ijc}$ (which equals one if a firm i operates in a service industry) and the three post-COVID year dummies.

The results in Panel B are consistent with the evidence on the generalization of inflation in Section 4. Specifically, in 2022, among firms citing pricing power associated with resilient demand, service-sector firms were able to sustain relatively higher markups than manufacturing firms. This evidence indicates that service firms with pricing power effectively leveraged resilient demand once supply chain constraints subsided but household inflation expectations remained elevated. As a result, they caught up to manufacturing firms in their price increases.

Overall, this analysis supports the view that when agents perceive inflation as broader and more persistent, firms can more readily sustain price increases beyond immediate cost pass-through, consistent with greater pricing power and reduced consumer price sensitivity. This regime shift helps propagate localized cost shocks into generalized inflation and supports higher markups even in sectors initially less exposed to supply disruptions.

5.2 Firms' pricing behavior and pre-COVID pricing power

To further evaluate how firms' pricing power interacts with elevated household inflation expectations in shaping firms' markup strategies, we estimate the following triple-interaction

specification at the firm-time level:

$$\begin{aligned}
Markup_{ijct+1} = & \sum_{\tau=20,21,22} \beta_{1\tau} Markup_{ijc}^{2018} \times Constraint_{jct} \times Year_{\tau} \\
& + \sum_{\tau=20,21,22} \beta_{2\tau} Markup_{ijc}^{2018} \times High\ Infl\ Exp_c \times Year_{\tau} \\
& + \beta_3 Markup_{ijc}^{2018} \times Constraint_{jct} + \beta_4 Markup_{ijc}^{2018} \times High\ Infl\ Exp_c \\
& + \sum_{\tau=20,21,22} \beta_{5\tau} Markup_{ijc}^{2018} \times Year_{\tau} + \beta_6 Markup_{ijc}^{2018} + \xi_{jct} + \epsilon_{ijct}, \quad (6)
\end{aligned}$$

where i is a firm, j is an industry, c is a country, and t is a time period (quarterly for the Compustat sample and annual for the Orbis sample). The main coefficient of interest is $\beta_{2\tau}$, which captures the influence of pre-pandemic pricing power (proxied by $Markup_{ijc}^{2018}$, the firm-level markup measured at the end of 2018) on the generalization of inflationary pressures through the rise in household inflation expectations. $High\ Infl\ Exp_c$ is again an indicator equal to one if the increase in the share of households expecting that prices will rise more rapidly is above the median in a country between 2021:Q1 and 2022:Q1. Moreover, $Constraint_{jct}$ is a vector encompassing the two supply-side constraints, $Material_{jct}$ and $Labor_{jct}$, both measured at the industry-country-time level. $Year$ is a set of dummy variables for 2020 (from Q2 onwards), 2021, and 2022, with 2019 again being the base year.

To isolate the firm-level impact of pricing power on markup dynamics, we include industry-country-time fixed effects to absorb time-varying shocks that simultaneously impact all firms within a given industry and country, such as policy interventions or demand fluctuations. These fixed effects also account for sector-specific differences in markup levels, arising from variations in cost structures, particularly the balance between fixed and variable costs across industries.

Column (1) of Panel A in [Table 9](#) presents the estimation results for the full Compustat sample, allowing for direct comparability with the analysis in [Table 8](#). The estimated coef-

1 ficient on the triple interaction between *High Infl Exp_c*, $Markup_{ijc}^{2018}$, and the *2022* dummy
 2 indicates that firms with greater pre-pandemic pricing power particularly benefited from el-
 3 evated household inflation expectations, enabling them to sustain relatively higher markups.
 4 Specifically, the estimates suggest that the markup difference between firms (scaled by the
 5 average markup) at the 90th and 10th percentile of $Markup_{ijc}^{2018}$ increased by 13% more in
 6 countries where household inflation expectations rose sharply, relative to countries with more
 7 stable expectations.³⁰

8 Column (2) focuses on service sector firms and shows that, even among firms without
 9 direct exposure to cost shocks, those with greater pre-pandemic pricing power were able to
 10 sustain relatively higher markups in countries with elevated household inflation expectations.
 11 Columns (3) and (4) confirm the robustness of these findings using EBITDA margins as a
 12 less model-dependent alternative to estimated markups, showing that firms with greater
 13 pre-COVID pricing power were able to sustain relatively higher profitability in environments
 14 with elevated inflation expectations.

15 Panel B of Table 9 further confirms that these results extend to the broader Orbis sample,
 16 which includes both public and private firms, showing that the observed pattern generalizes
 17 to a more heterogeneous and representative firm population. Here, the markup gap between
 18 firms at the 90th and 10th percentile of $Markup_{ijc}^{2018}$ widened by 4% more (relative to the
 19 average markup) in countries where inflation expectations rose sharply compared to those
 20 with more stable expectations.³¹

21 Taken together, the interaction between high inflation expectations and firms' pricing

³⁰These results align with Konczal et al. (2022), which finds that 2021 recorded the highest markups and the largest annual increase in markups in the U.S. since 1955, particularly among firms with already elevated pre-pandemic markups.

³¹The differences in the estimated effect magnitudes between Panels A and B are likely driven by the fact that average firm size, and thus pricing power, is significantly higher in the Compustat sample than in the Orbis sample.

Panel A: Compustat data				
	(1)	(2)	(3)	(4)
	Markup _{ijct+1}	Markup _{ijct+1}	Margin _{ijct+1}	Margin _{ijct+1}
Sample	Full	Services	Full	Services
High Infl Exp _c × Markup _{ijc} ²⁰¹⁸ × 2020 _t	0.066 (0.076)	0.023 (0.211)	0.012 (0.027)	−0.059 (0.067)
High Infl Exp _c × Markup _{ijc} ²⁰¹⁸ × 2021 _t	0.068 (0.058)	0.158 (0.173)	0.055** (0.022)	0.033 (0.075)
High Infl Exp _c × Markup _{ijc} ²⁰¹⁸ × 2022 _t	0.140*** (0.037)	0.289** (0.100)	0.110*** (0.021)	0.159* (0.072)
Observations	19,538	6,448	19,538	6,448
R-squared	0.804	0.708	0.748	0.739
Panel B: Orbis data				
	(1)	(2)	(3)	(4)
	Markup _{ijct+1}	Markup _{ijct+1}	Margin _{ijct+1}	Margin _{ijct+1}
Sample	Full	Services	Full	Services
High Infl Exp _c × Markup _{ijc} ²⁰¹⁸ × 2020 _t	0.012 (0.009)	0.013 (0.009)	0.019*** (0.005)	0.021*** (0.006)
High Infl Exp _c × Markup _{ijc} ²⁰¹⁸ × 2021 _t	0.021 (0.015)	0.023 (0.016)	0.026** (0.012)	0.032** (0.014)
High Infl Exp _c × Markup _{ijc} ²⁰¹⁸ × 2022 _t	0.039** (0.018)	0.039** (0.018)	0.032* (0.016)	0.036** (0.016)
Observations	2,799,376	1,956,227	2,799,376	1,956,227
R-squared	0.681	0.686	0.481	0.486
Industry-country-time FE				
	✓	✓	✓	✓

Table 9: Firms’ pricing behavior and pre-COVID pricing power. This table presents estimation results from Specification (6). Panel A presents results using quarterly firm-level data from Compustat Global, focusing on publicly listed firms, while Panel B reports results using the broader Orbis sample, which includes both public and private firms at an annual frequency. Columns (1) and (3) are estimated in the full sample. Columns (2) and (4) are estimated in the sample of firms operating in service sectors. The subscript notation is defined as follows: i is a firm, j is an industry, c is a country, and t is a time period. The dependent variable in Columns (1) and (2) is a firm’s one-period-ahead markup, estimated following [Loecker and Warzynski \(2012\)](#), while the dependent variable in Columns (3) and (4) is a firm’s one-period-ahead EBITDA margin (EBITDA/Sales). $Markup^{2018}$ measures a firm’s markup in the fiscal year 2018. *High Infl Exp_c* is an indicator equal to one if the increase in the share of households expecting that prices will rise more rapidly is above the median in a country between 2021:Q1 and 2022:Q1. Standard errors in parentheses are clustered at the country level. In Panel A, we apply the “LZ2” bias-reduction modification of [Imbens and Kolesar \(2016\)](#); implementing this correction is computationally infeasible for the larger sample in Panel B. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

- 1 power thus appears to contribute to the emergence of generalized inflation, spreading infla-
- 2 tionary pressures across the broader economy.

6 Conclusion

The post-pandemic era witnessed supply-side shocks that, combined with a swift economic recovery, led to a dramatic rise in inflation rates, levels not seen in many decades. In this paper, we document the complex interactions between supply chain pressures, firm pricing power, and household inflation expectations that contributed to the surge, generalization, and persistence of post-pandemic inflation in the euro area.

We find that supply chain disruptions generated localized inflation through a cost-push mechanism in sectors directly exposed to the shock, such as manufacturing. They also contributed to the perception that pandemic-related cost pressures had become economy-wide and persistent, as reflected in rising inflation expectations. Moreover, we show that this perceived move toward a generalized inflation regime is closely associated with the subsequent broadening of inflation into sectors initially less exposed to supply-side disruptions (most notably services) beginning in the second half of 2021. Overall, our findings suggest that supply-side inflationary impulses can generalize and intensify when inflation is perceived as broad-based, weakening consumer price sensitivity and enabling firms to sustain higher markups.

From a policy perspective, three main implications emerge. First, “see through the shock” policy approaches may need to account for the possibility of persistent, intertwined inflationary pressures. Policymakers may need to be prepared to act decisively to adjust the monetary policy stance if inflation expectations show the first signs of becoming unanchored. Second, elevated consumer inflation expectations can enhance firms’ pricing power, even for those not directly affected by the initial shock, thereby constituting an empirically tangible version of “excuseflation.” This implication supports measures that promote competition, thereby curbing the inflationary tendencies of dominant market players. Third, policymakers can help prevent unanchored inflation expectations from translating into actual inflation by communicating transparently about relatively opaque cost shocks. This communication

1 should clarify the shocks’ magnitude and duration and be paired with a clear commitment
2 to price stability.

3 From a research perspective, our results are consistent both with consumers searching
4 less for better deals when they expect broadly higher prices (the price search channel) and
5 with firms facing less customer pushback when price increases are perceived as driven by
6 economy-wide cost pressures (customer antagonization channel). However, fully quantifying
7 these channels’ relative importance, and understanding how they interact with wage-cost
8 dynamics and monetary policy, is beyond the scope of this paper. A more comprehensive
9 empirical and theoretical assessment of these channels, both in the context of the post-
10 COVID inflation surge and across other inflationary episodes, remains an important avenue
11 for future research.

References

- ACHARYA, V. V., T. JOHNSON, S. SUNDARESAN, AND S. ZHENG (2023): “Disasters with unobservable duration and frequency: Intensified responses and diminished preparedness,” Tech. rep., National Bureau of Economic Research.
- ACKERBERG, D., K. CAVES, AND G. FRAZER (2015): “Identification properties of recent production function estimators,” *Econometrica*, 83, 2411–2451.
- ALESSANDRIA, G., S. KHAN, A. KHEDERLARIAN, C. MIX, AND K. RUHL (2022): “The aggregate effects of global and local supply chain disruptions: 2020–2022,” *Working Paper*.
- AMITI, M., S. HEISE, F. KARAHAN, AND A. ŞAHİN (2022): “Inflation strikes back: The return of wage to price pass-through,” *Working Paper*.
- ANAYI, L. S., N. BLOOM, P. BUNN, P. MIZEN, G. THWAITES, AND I. YOTZOV (2022): “Firming up price inflation,” *Working Paper*.
- ANDRADE, P., R. K. CRUMP, S. EUSEPI, AND E. MOENCH (2016): “Fundamental disagreement,” *Journal of Monetary Economics*, 83, 106–128.
- ANDRE, P., I. HAALAND, C. ROTH, M. WIEDERHOLT, AND J. WOHLFART (2024): “Narratives about the macroeconomy,” *Working Paper*.
- ANDRE, P., C. PIZZINELLI, C. ROTH, AND J. WOHLFART (2022): “Subjective models of the macroeconomy: Evidence from experts and representative samples,” *The Review of Economic Studies*, 89, 2958–2991.

- ARMANTIER, O., W. BRUINE DE BRUIN, G. TOPA, W. VAN DER KLAUW, AND B. ZAFAR (2015): “Inflation expectations and behavior: Do survey respondents act on their beliefs?” *International Economic Review*, 56, 505–536.
- ASCARI, G., S. FASANI, J. GRAZZINI, AND L. ROSSI (2023): “Endogenous uncertainty and the macroeconomic impact of shocks to inflation expectations,” *Journal of Monetary Economics*.
- BAI, X., J. FERNÁNDEZ-VILLAYERDE, Y. LI, AND F. ZANETTI (2024): “The causal effects of global supply chain disruptions on macroeconomic outcomes: Evidence and theory,” .
- BALL, L. M., D. LEIGH, AND P. MISHRA (2022): “Understanding U.S. inflation during the COVID era,” *Working Paper*.
- BĄKOWSKA, K., A. BORLESCU, E. CHARALAMBAKIS, A. DIAS DA SILVA, D. DI LAUREA, M. DOSSCHE, D. GEORGARAKOS, J. HONKKILA, N. KENNEDY, G. KENNY, ET AL. (2021): “ECB consumer expectations survey: An overview and first evaluation,” *ECB Occasional Paper*.
- BENABOU, R. AND R. GERTNER (1993): “Search with learning from prices: Does increased inflationary uncertainty lead to higher markups?” *The Review of Economic Studies*, 60, 69–93.
- BENIGNO, G., J. DI GIOVANNI, J. J. GROEN, AND A. I. NOBLE (2022): “The GSCPI: A new barometer of global supply chain pressures,” *Working Paper*.
- BERNANKE, B. AND O. BLANCHARD (2023): “What caused the U.S. pandemic-era inflation?” *Hutchins Center Working Papers*.
- BILBIE, F. O. AND D. R. KÄNZIG (2023): “Greed? Profits, inflation, and aggregate demand,” *Working Paper*.
- BINICI, M., S. CENTORRINO, S. CEVIK, AND G. GWON (2022): “Here comes the change: The role of global and domestic factors in post-pandemic inflation in Europe,” *Working Papers*.
- BLANCO, A., P. OTTONELLO, AND T. RANOSOVA (2022): “The dynamics of large inflation surges,” Tech. rep., National Bureau of Economic Research.
- BLINDER, A., E. R. CANETTI, D. E. LEBOW, AND J. B. RUDD (1998): *Asking about prices: A new approach to understanding price stickiness*, Russell Sage Foundation.
- BORDALO, P., N. GENNAIOLI, S. Y. KWON, AND A. SHLEIFER (2021): “Diagnostic bubbles,” *Journal of Financial Economics*, 141, 1060–1077.
- BORDALO, P., N. GENNAIOLI, R. L. PORTA, AND A. SHLEIFER (2019): “Diagnostic expectations and stock returns,” *The Journal of Finance*, 74, 2839–2874.
- BORDALO, P., N. GENNAIOLI, AND A. SHLEIFER (2012): “Salience theory of choice under risk,” *The Quarterly Journal of Economics*, 127, 1243–1285.
- (2018): “Diagnostic expectations and credit cycles,” *The Journal of Finance*, 73, 199–227.

- BRACHA, A. AND J. TANG (2025): “Inflation levels and (in)attention,” *Review of Economic Studies*, 92, 1564–1594.
- BRÄUNING, F., J. L. FILLAT, AND G. JOAQUIM (2022): “Cost-price relationships in a concentrated economy,” *Working Paper*.
- BUCHHEIM, L., S. LINK, AND S. MÖHRLE (2024): “Inflation and wage expectations of firms and employees,” *Working Paper*.
- CAI, M. AND T. VANDYCK (2020): “Bridging between economy-wide activity and household-level consumption data: Matrices for European countries,” *Data in brief*, 30, 105395.
- CARRIERE-SWALLOW, Y., P. DEB, D. FURCERI, D. JIMENEZ, AND J. D. OSTRY (2022): “Shipping costs and inflation,” *Working Paper*.
- CARROLL, C. D. (2003): “Macroeconomic expectations of households and professional forecasters,” *Quarterly Journal of Economics*, 118, 269–298.
- CAVALLO, A., G. CRUCES, AND R. PEREZ-TRUGLIA (2017): “Inflation expectations, learning, and supermarket prices: Evidence from survey experiments,” *American Economic Journal: Macroeconomics*, 9, 1–35.
- CELASUN, O., N.-J. HANSEN, A. MINESHIMA, M. SPECTOR, AND J. ZHOU (2022): “Supply bottlenecks: Where, why, how much, and what next?” *IMF Working Paper*.
- CHODOROW-REICH, G., G. GOPINATH, P. MISHRA, AND A. NARAYANAN (2020): “Cash and the economy: Evidence from India’s demonetization,” *The Quarterly Journal of Economics*, 135, 57–103.
- CHOI, H. AND H. VARIAN (2012): “Predicting the present with Google Trends,” *Economic Record*, 88, 2–9.
- COIBION, O., D. GEORGARAKOS, Y. GORODNICHENKO, AND M. VAN ROOIJ (2023): “How does consumption respond to news about inflation? Field evidence from a randomized control trial,” *American Economic Journal: Macroeconomics*, 15, 109–152.
- COIBION, O. AND Y. GORODNICHENKO (2015): “Is the Phillips curve alive and well after all? Inflation expectations and the missing disinflation,” *American Economic Journal: Macroeconomics*, 7, 197–232.
- COIBION, O., Y. GORODNICHENKO, AND M. WEBER (2025): “The upcoming Trump tariffs: What Americans expect and how they are responding,” *Working Paper*.
- COMIN, D., R. C. JOHNSON, AND C. JONES (2023): “Supply chain constraints and inflation,” *Working Paper*.
- CRUMP, R. K., S. EUSEPI, A. TAMBALOTTI, AND G. TOPA (2022): “Subjective intertemporal substitution,” *Journal of Monetary Economics*, 126, 118–133.

- DE BRUIN, W. B., W. VAN DER KLAUW, AND G. TOPA (2011): “Expectations of inflation: The biasing effect of thoughts about specific prices,” *Journal of Economic Psychology*, 32, 834–845.
- DE LOECKER, J., J. EECKOUT, AND G. UNGER (2020): “The rise of market power and the macroeconomic implications,” *Quarterly Journal of Economics*, 135, 561–644.
- DIETRICH, A. M. (2024): “Consumption categories, household attention, and inflation expectations: Implications for optimal monetary policy,” *Journal of Monetary Economics*, 103594.
- DRÄGER, L. AND M. J. LAMLA (2017): “Imperfect information and consumer inflation expectations: Evidence from microdata,” *Oxford Bulletin of Economics and Statistics*, 79, 933–968.
- DRÄGER, L. AND G. NGHIEM (2021): “Are consumers’ spending decisions in line with a Euler equation?” *Review of Economics and Statistics*, 103, 580–596.
- DUCA-RADU, I., G. KENNY, AND A. REUTER (2021): “Inflation expectations, consumption and the lower bound: Micro evidence from a large multi-country survey,” *Journal of Monetary Economics*, 118, 120–134.
- D’ACUNTO, F., D. HOANG, M. PALOVIITA, AND M. WEBER (2023): “IQ, expectations, and choice,” *The Review of Economic Studies*, 90, 2292–2325.
- D’ACUNTO, F., D. HOANG, AND M. WEBER (2022): “Managing households’ expectations with unconventional policies,” *The Review of Financial Studies*, 35, 1597–1642.
- D’ACUNTO, F., U. MALMENDIER, J. OSPINA, AND M. WEBER (2021): “Exposure to grocery prices and inflation expectations,” *Journal of Political Economy*, 129, 1615–1639.
- D’ACUNTO, F. AND M. WEBER (2024): “Why survey-based subjective expectations are meaningful and important,” *Annual Review of Economics*, 16.
- EYSTER, E., K. MADARÁSZ, AND P. MICHAILLAT (2021): “Pricing under fairness concerns,” *Journal of the European Economic Association*, 19, 1853–1898.
- FETZER, T., L. HENSEL, J. HERMLE, AND C. ROTH (2021): “Coronavirus perceptions and economic anxiety,” *Review of Economics and Statistics*, 103, 968–978.
- FINCK, D. AND P. TILLMANN (2022): “The macroeconomic effects of global supply chain disruptions,” *Working Paper*.
- FISHMAN, A. (1996): “Search with learning and price adjustment dynamics,” *The Quarterly Journal of Economics*, 111, 253–268.
- FRANZONI, F., M. GIANNETTI, AND R. TUBALDI (2023): “Supply chain shortages, large firms’ market power, and inflation,” *Working Paper*.
- FREY, B. S. AND W. W. POMMEREHNE (1993): “On the fairness of pricing—an empirical survey among the general population,” *Journal of Economic Behavior & Organization*, 20, 295–307.

- GABAIX, X. (2014): “A sparsity-based model of bounded rationality,” *The Quarterly Journal of Economics*, 129, 1661–1710.
- GABALLO, G. AND L. PACIELLO (2022): “Spending allocation under nominal uncertainty: A model of effective price rigidity,” *Working Paper*.
- GAUTIER, E., F. SAVIGNAC, AND O. COIBION (2025): “Firms’ inflation and wage expectations during the inflation surge,” *Working Paper*.
- GIELISSEN, R., C. E. DUTILH, AND J. J. GRAAFLAND (2008): “Perceptions of price fairness: An empirical research,” *Business & Society*, 47, 370–389.
- ICHIUE, H. AND S. NISHIGUCHI (2015): “Inflation expectations and consumer spending at the zero bound: Micro evidence,” *Economic Inquiry*, 53, 1086–1107.
- IMBENS, G. W. AND M. KOLESAR (2016): “Robust standard errors in small samples: Some practical advice,” *Review of Economics and Statistics*, 98, 701–712.
- ISAACSON, M. AND H. RUBINTON (2022): “Shipping prices and import price inflation,” *Working Paper*.
- JIMÉNEZ-RODRÍGUEZ, R. AND A. MORALES-ZUMAQUERO (2022): “Commodity price pass-through along the pricing chain,” *Review of World Economics*, 158, 109–125.
- KAHNEMAN, D., J. L. KNETSCH, R. THALER, ET AL. (1986): “Fairness as a constraint on profit seeking: Entitlements in the market,” *American Economic Review*, 76, 728–741.
- KALEMLI-OZCAN, S., A. SILVA, M. A. YILDIRIM, AND J. DI GIOVANNI (2022): “Global supply chain pressures, international trade, and inflation,” *Working Paper*.
- KONCZAL, M., N. LUSIANI, AND R. INSTITUTE (2022): “Prices, profits, and power: An analysis of 2021 firm-level markups,” *Working Paper*.
- KORENOK, O., D. MUNRO, AND J. CHEN (2022): “Inflation and attention thresholds,” *Working Paper*.
- LARSEN, V. H., L. A. THORSRUD, AND J. ZHULANOVA (2021): “News-driven inflation expectations and information rigidities,” *Journal of Monetary Economics*, 117, 507–520.
- LAUDENBACH, C., A. WEBER, R. WEBER, AND J. WOHLFART (2024): “Beliefs about the stock market and investment choices: Evidence from a survey and a field experiment,” *The Review of Financial Studies*, hhae063.
- LEVINSOHN, J. AND A. PETRIN (2003): “Estimating production functions using inputs to control for unobservables,” *Review of Economic Studies*, 70, 317–341.
- LINK, S., A. PEICHL, C. ROTH, AND J. WOHLFART (2024): “Attention to the macroeconomy,” *Available at SSRN 4697814*.

- LOECKER, J. D. AND F. WARZYNSKI (2012): “Markups and firm-level export status,” *American Economic Review*, 102, 2437–2471.
- LUCAS, R. E. (1972): “Expectations and the neutrality of money,” *Journal of Economic Theory*, 4, 103–124.
- (1973): “Some international evidence on output-inflation tradeoffs,” *The American economic review*, 63, 326–334.
- MALMENDIER, U. AND S. NAGEL (2016): “Learning from inflation experiences,” *The Quarterly Journal of Economics*, 131, 53–87.
- MANKIW, N. G. AND R. REIS (2002): “Sticky information versus sticky prices: A proposal to replace the New Keynesian Phillips curve,” *The Quarterly Journal of Economics*, 117, 1295–1328.
- MAZUMDER, S. (2021): “The reaction of inflation forecasts to news about the Fed,” *Economic Modelling*, 94, 256–264.
- MCCAFFREY, D. F. AND R. M. BELL (2003): “Bias reduction in standard errors for linear regression with multi-stage samples,” *Quality control and applied statistics*, 48, 677–682.
- MEI, P. AND L. WU (2024): “Thinking about the economy, deep or shallow?” *Working Paper*.
- OLLEY, G. S. AND A. PAKES (1996): “The dynamics of productivity in the telecommunications equipment industry,” *Econometrica*, 1263–1297.
- PFÄUTI, O. (2022): “Inflation—who cares? Monetary policy in times of low attention,” *Working Paper*.
- PHELPS, E. S. (1968): “Money-wage dynamics and labor-market equilibrium,” *Journal of Political Economy*, 76, 678–711.
- PIRON, R. AND L. FERNANDEZ (1995): “Are fairness constraints on profit-seeking important?” *Journal of Economic Psychology*, 16, 73–96.
- RANYARD, R., F. DEL MISSIER, N. BONINI, D. DUXBURY, AND B. SUMMERS (2008): “Perceptions and expectations of price changes and inflation: A review and conceptual framework,” *Journal of Economic Psychology*, 29, 378–400.
- REIS, R. (2022a): “The burst of high inflation in 2021-22: How and why did we get here?” *Working Paper*.
- (2022b): “Losing the inflation anchor,” *Brookings Papers on Economic Activity*, 2021, 307–379.
- (2023): “Four mistakes in the use of measures of expected inflation,” *AEA Papers and Proceedings*, 113, 47–51.

- ROTEMBERG, J. J. (2005): “Customer anger at price increases, changes in the frequency of price adjustment and monetary policy,” *Journal of Monetary Economics*, 52, 829–852.
- (2008): “Behavioral aspects of price setting, and their policy implications,” Tech. rep., National Bureau of Economic Research.
- SHILLER, R. J., M. BOYCKO, AND V. KOROBV (1991): “Popular attitudes toward free markets: The Soviet Union and the United States compared,” *The American Economic Review*, 81, 385–400.
- SIMS, C. A. (2003): “Implications of rational inattention,” *Journal of monetary Economics*, 50, 665–690.
- STAIGER, D. AND J. STOCK (1997): “Instrumental variables regression with weak instruments,” *Econometrica*, 65, 557–586.
- TAYLOR, J. B. (1980): “Aggregate dynamics and staggered contracts,” *Journal of Political Economy*, 88, 1–23.
- URBANY, J. E., T. J. MADDEN, AND P. R. DICKSON (1989): “All’s not fair in pricing: An initial look at the dual entitlement principle,” *Marketing Letters*, 1, 17–25.
- VASWANI, A., N. SHAZEER, N. PARMAR, J. USZKOREIT, L. JONES, A. N. GOMEZ, L. KAISER, AND I. POLOSUKHIN (2017): “Attention is all you need,” *Advances in Neural Information Processing Systems*, 30.
- WEBER, M., B. CANDIA, T. ROPELE, R. LLUBERAS, S. FRACHE, B. MEYER, S. KUMAR, Y. GORODNICHENKO, D. GEORGARAKOS, O. COIBION, ET AL. (2025): “Tell me something I don’t already know: Learning in low-and high-inflation settings,” *Econometrica*, 93, 229–264.
- WEBER, M., F. D’ACUNTO, Y. GORODNICHENKO, AND O. COIBION (2022): “The subjective inflation expectations of households and firms: Measurement, determinants, and implications,” *Journal of Economic Perspectives*, 36, 157–184.
- WONG, B. (2015): “Do inflation expectations propagate the inflationary impact of real oil price shocks?: Evidence from the Michigan survey,” *Journal of Money, Credit and Banking*, 47, 1673–1689.
- WOODFORD, M. (2003): “Imperfect common knowledge and the effects of monetary policy,” *Knowledge, information, and expectations in modern macroeconomics: In honor of Edmund S. Phelps*, 25, 4.

Online Appendix

OA.1 Markup estimation

To obtain firm-level markups, we follow the procedure proposed in [Loecker and Warzynski \(2012\)](#), which relies on the insight that the output elasticity of a variable production factor is only equal to its expenditure share in total revenue when price equals marginal cost of production. Under any form of imperfect competition, however, the relevant markup drives a wedge between the input's revenue share and its output elasticity.

In particular, this approach relies on standard cost minimization conditions for variable input factors free of adjustment costs. To obtain output elasticities, a production function has to be estimated. A major challenge is a potential simultaneity bias since the output may be determined by productivity shocks, which might be correlated with a firm's input choice.

To correct the markup estimates for unobserved productivity shocks, [Loecker and Warzynski \(2012\)](#) follows the control function or proxy approach, developed by [Akerberg, Caves, and Frazer \(2015\)](#), based on [Olley and Pakes \(1996\)](#) and [Levinsohn and Petrin \(2003\)](#). This approach requires a production function with a scalar Hicks-neutral productivity term (i.e., changes in productivity do not affect the proportion of factor inputs) and that firms can be pooled together by time-invariant common production technology at the industry-country level.

Hence, we consider the case where in each period t , firm i minimizes the contemporaneous production costs given the following production function:

$$Q_{ijt} = Q_{ijt}(\Omega_{ijt}, V_{ijt}, K_{ijt}), \tag{OA.1}$$

where Q_{ijt} is the output quantity produced by technology $Q_{ijt}(\cdot)$, V_{ijt} the variable input factor, K_{ijt} the capital stock (treated as a dynamic input in production), and Ω_{ijt} the firm-specific Hicks-neutral productivity term. Following [De Loecker, Eeckhout, and Unger \(2020\)](#), we assume that within a year the variable input can be adjusted without frictions, while adjusting the capital stock involves frictions.

As we assume that producers are cost minimizing, we have the following Lagrangian:

$$\mathcal{L}(V_{ijt}, K_{ijt}, \lambda_{ijt}) = P_{ijt}^V V_{ijt} + r_{ijt} K_{ijt} + F_{ijt} - \lambda_{ijt}(Q(\cdot) - \bar{Q}_{ijt}), \quad (\text{OA.2})$$

where P^V is the price of the variable input, r is the user cost of capital, F_{ijt} is the fixed cost, and λ_{ijt} is the Lagrange multiplier. The first order condition with respect to the variable input V is thus given by:

$$\frac{\partial \mathcal{L}_{ijt}}{\partial V_{ijt}} = P_{ijt}^V - \lambda_{ijt} \frac{\partial Q(\cdot)}{\partial V_{ijt}} = 0. \quad (\text{OA.3})$$

Multiplying by V_{ijt}/Q_{ijt} , and rearranging terms yields an expression for input V 's output elasticity:

$$\theta_{ijt}^v \equiv \frac{\partial Q(\cdot)}{\partial V_{ijt}} \frac{V_{ijt}}{Q_{ijt}} = \frac{1}{\lambda_{ijt}} \frac{P_{ijt}^V V_{ijt}}{Q_{ijt}}. \quad (\text{OA.4})$$

As the Lagrange multiplier λ is the value of the objective function as we relax the output constraints, it is a direct measure of the marginal costs. We thus define the markup as $\mu = P/\lambda$, where P is the price for the output good, which depends on the extent of market power. Substituting marginal costs for the markup/price ratio, we obtain a simple expression for the markup:

$$\mu_{ijt} = \theta_{ijt}^v \frac{P_{ijt} Q_{ijt}}{P_{ijt}^V V_{ijt}}. \quad (\text{OA.5})$$

Hence, there are two ingredients needed to estimate the markup of firm i : its expenditure share of the variable input, $P_{ijt} Q_{ijt}/P_{ijt}^V V_{ijt}$, which is readily observable in the data, and its output elasticity of the variable input, θ_{ijt}^v .

To obtain an estimate of the output elasticity of the variable input of production, we estimate a parametric production function for each industry (at the 2-digit NACE level).

For a given industry in country c , we consider the translog production function (TLPF):³²

$$q_{ijt} = \beta_{v1}v_{ijt} + \beta_{k1}k_{ijt} + \beta_{v2}v_{ijt}^2 + \beta_{k2}k_{ijt}^2 + \omega_{ijt} + \epsilon_{ijt}. \quad (\text{OA.6})$$

where lower cases denote logs.³³ In particular, q_{ijt} is the log of the realized firm's output (i.e., deflated turnover), v_{ijt} the log of the variable input factor (i.e., cost of goods sold for the Compustat sample, and cost of goods sold plus other operational expenditures for the Orbis sample, as COGS is not reported separately), k_{ijt} the log of the capital stock (i.e., tangible assets), $\omega_{ijt} = \ln(\Omega_{ijt})$, and ϵ_{ijt} is the unanticipated shock to output.³⁴ Moreover, we follow best practice and deflate these variables with the relevant industry-country specific deflator.

We follow the literature and control for the simultaneity and selection bias, inherently present in the estimation of Eq. (OA.6), and rely on a control function approach, paired with a law of motion for productivity, to estimate the output elasticity of the variable input.

This method relies on a so-called two-stage approach. In the first stage, the estimates of the expected output ($\hat{\phi}_{ijt}$) and the unanticipated shocks to output (ϵ_{ijt}) are purged using a non-parametric projection of output on the inputs and the control variable:

$$q_{ijt} = \phi_{ijt}(v_{ijt}, k_{ijt}) + \epsilon_{ijt}. \quad (\text{OA.7})$$

The second stage provides estimates for all production function coefficients by relying on the

³²The TLPF is a common technology specification that includes higher order terms that is more flexible than, e.g., a Cobb-Douglas production function. The departure from the standard Cobb-Douglas production function is important for our purpose. If we were to restrict the output elasticities to be independent of input use intensity when analyzing how markup differs across firms, we would be attributing variation in technology to variation in markups, and potentially bias our results.

³³Following De Loecker, Eeckout, and Unger (2020), we do not consider the interaction term between v and k to minimize the potential impact of measurement error in capital to contaminate the parameter of most interest, i.e., the output elasticity.

³⁴Loecker and Warzynski (2012) shows that when relying on revenue data (instead of physical output), only the markup level is potentially affected but not the estimate of the correlation between markups and firm-level characteristics or how markups change over time.

law of motion for productivity:

$$\omega_{ijt} = g_t(\omega_{ijt-1}) + \varepsilon_{ijt}. \quad (\text{OA.8})$$

We can compute productivity for any value of β , where $\beta = (\beta_{v1}, \beta_{k1}, \beta_{v2}, \beta_{k2})$, using $\omega_{ijt}(\beta) = \hat{\phi} - (\beta_{v1}v_{ijt} + \beta_{k1}k_{ijt} + \beta_{v2}v_{ijt}^2 + \beta_{k2}k_{ijt}^2)$. By nonparametrically regressing $\omega_{ijt}(\beta)$ on its lag, $\omega_{ijt-1}(\beta)$, we recover the innovation to productivity given β , $\varepsilon_{ijt}(\beta)$.

This gives rise to the following moment conditions, which allow us to obtain estimates of the production function parameters:

$$E \left(\varepsilon_{ijt}(\beta) \begin{pmatrix} v_{ijt-1} \\ k_{ijt} \\ v_{ijt-1}^2 \\ k_{ijt}^2 \end{pmatrix} \right) = 0, \quad (\text{OA.9})$$

where we use standard GMM techniques to obtain the estimates of the production function and rely on block bootstrapping for the standard errors. These moment conditions exploit the fact that the capital stock is assumed to be decided a period ahead and thus should not be correlated with the innovation in productivity. We rely on the lagged variable input to identify the coefficients on the current variable input since the current variable input is expected to react to shocks to productivity.

The output elasticities are computed using the estimated coefficients of the production function:

$$\theta_{ijt}^v = \hat{\beta}_{v1} + 2\hat{\beta}_{v2}v_{ijt}, \quad (\text{OA.10})$$

which allows us to calculate the markup of firm i .

OA.2 Additional figures



Figure OA.1: Inflation in euro area. This figure shows the CPI growth in the euro area at a monthly frequency from January 2016 to April 2023. Source: Eurostat.

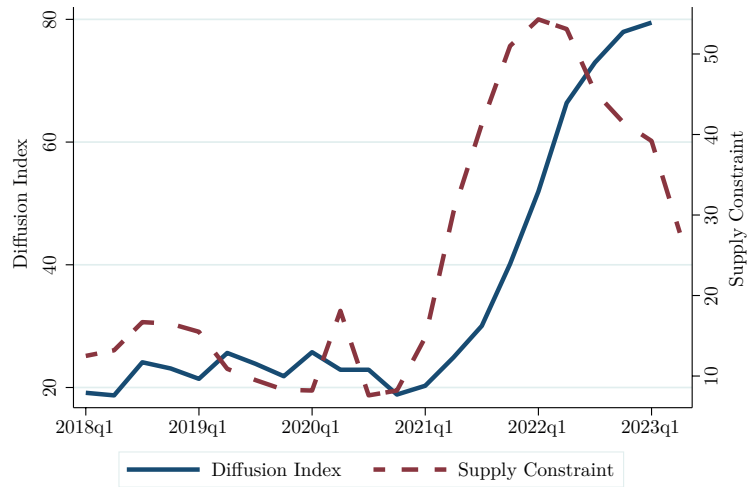


Figure OA.2: Inflation diffusion index. The figure shows the time-series evolution of an inflation diffusion index (blue line) and the time-series evolution of the supply chain constraint (red dashed line). The diffusion index is defined by assigning a value of 0 to product-quarters that have an annual inflation of less than 2%, a value of 50 to product-quarters with an annual inflation between 2% and 4%, and a value of 100 to product-quarters with an annual inflation of more than 4%.

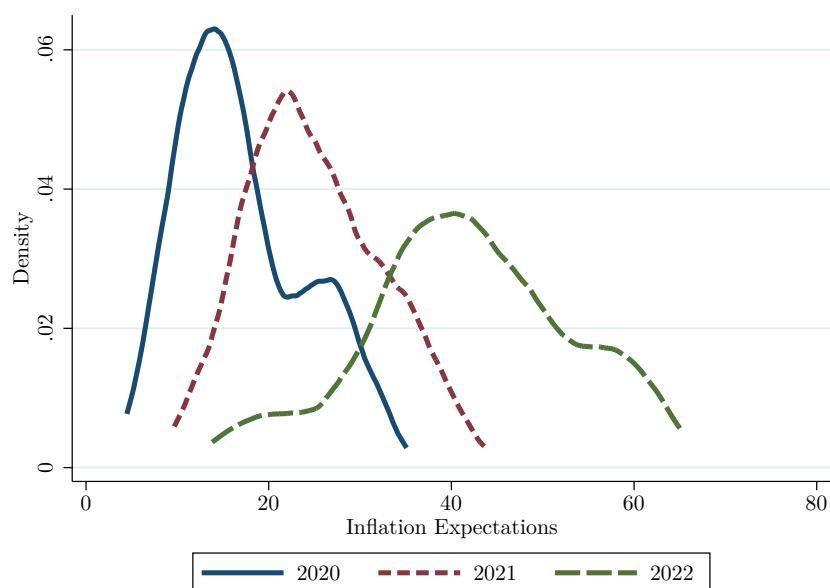


Figure OA.3: Distribution of inflation expectations over time. The figure shows three snapshots of the distribution of one-year ahead household inflation expectations.



Figure OA.4: Chinese lockdown stringency index. This figure shows the time-series evolution of the aggregate stringency index of the top-5 exporting provinces in China. Source: OxCGRT.

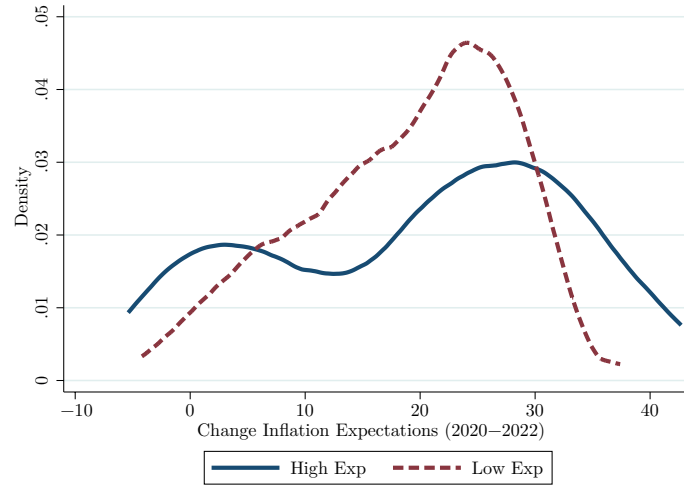


Figure OA.5: Growth in the share of households with high inflation expectations (growth between 2020 and 2022). The figure plots the growth in the share of households who believe prices will increase more rapidly, separately for high and low inflation expectation countries.

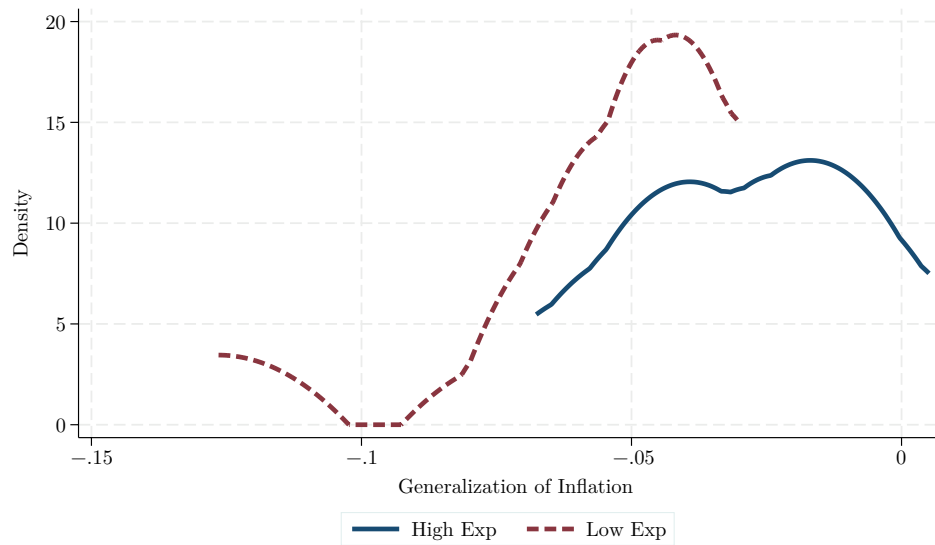


Figure OA.6: Difference service – manufacturing inflation in high vs. low inflation expectation countries (growth between 2020 and 2022). The figure plots the density (across countries, with countries bracketed by high vs. low inflation expectations) of the difference in service vs. manufacturing inflation from 2020 to 2022.

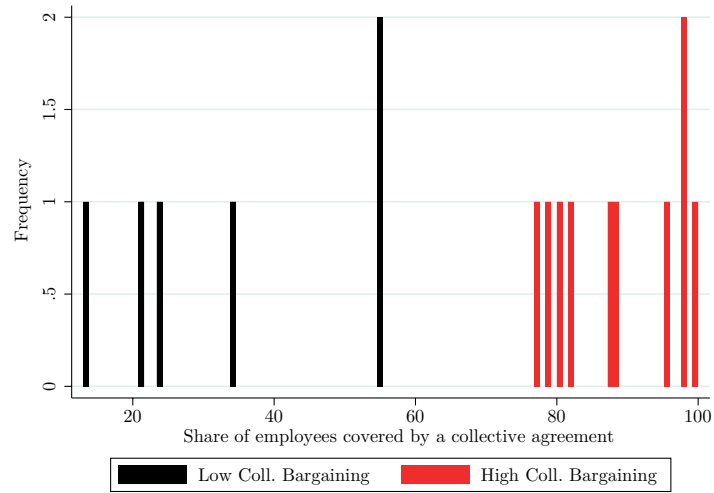


Figure OA.7: Share of employees covered by a collective agreement. This figure shows the distribution of the adjusted collective bargaining coverage rate from the OECD/AIAS ICTWSS database for our sample countries. This coverage rate is defined as the number of employees covered by a collective agreement in force as a proportion of the number of eligible employees (i.e., the total number of employees minus the number of employees legally excluded from the right to bargain).

OA.3 Additional tables

	Mean	SD	p25	Median	p75
ΔCPI_{pct+1}	1.012	4.575	-0.039	0.544	1.934
Material_{pct}	11.459	14.831	0.002	6.355	16.538
Labor_{pct}	17.401	14.114	6.099	14.341	25.684
Other_{pct}	20.911	17.763	9.093	15.378	26.682
Financial_{pct}	5.645	6.340	1.876	3.907	7.249
Equipment_{pct}	1.198	3.021	0.002	0.104	0.900
$\text{China Dependence}_{pc,2019}$	0.008	0.012	0.000	0.001	0.010
$\text{Markup}_{ijc}^{2018}$	1.270	0.310	1.146	1.227	1.310
Service_{pc}	0.437	0.438	0.030	0.183	1.000

Table OA.1: Summary statistics. This table reports summary statistics for the main variables used in the analysis.

	(1) $\hat{\pi}_{hct}^{e,ST}$	(2) $\hat{\pi}_{hct}^{e,ST}$	(3) $\hat{\pi}_{hct}^{e,ST}$	(4) $\hat{\pi}_{hct}^{e,ST}$
Awareness _{hc} × Google _{ct} × Material _{ct}	1.341*** (0.337)	1.308*** (0.450)	2.227*** (0.470)	1.493*** (0.435)
Material _{ct} × Awareness _{hc}	0.140 (0.151)	0.514* (0.289)	-0.497** (0.235)	0.368 (0.277)
Awareness _{hc} × Google _{ct}	-0.293*** (0.097)	-0.163 (0.098)	-0.089 (0.087)	-0.147 (0.104)
Awareness _{hc} × Food Inflation _{ct}	0.542*** (0.171)		1.963* (1.031)	
Awareness _{hc} × Food Inflation _{ct} × Google _{ct}			-2.096 (1.760)	
Awareness _{hc} × Energy Inflation _{ct}	0.186*** (0.040)		0.262 (0.203)	
Awareness _{hc} × Energy Inflation _{ct} × Google _{ct}			-0.085 (0.344)	
Awareness _{hc} × Core Inflation _{ct}	2.560*** (0.830)		8.960*** (2.718)	
Awareness _{hc} × Core Inflation _{ct} × Google _{ct}			-11.845** (4.416)	
Perceived (realized) inflation _{hct}		0.900*** (0.068)		1.555*** (0.226)
Awareness _{hc} × Perceived (realized) inflation _{hct}		-0.126** (0.055)		0.516 (0.359)
Perceived (realized) inflation _{hct} × Google _{ct}				-1.179*** (0.369)
Awareness _{hc} × Perceived (realized) inflation _{hct} × Google _{ct}				-0.957* (0.517)
Observations	103,088	103,088	103,088	103,088
R-squared	0.549	0.556	0.549	0.556
Country-time FE	✓	✓	✓	✓
Household FE	✓	✓	✓	✓

Table OA.2: Supply chain constraint pass-through to household inflation expectations: Interactions with household characteristics. This table presents estimation results from an adjusted version of Specification (2). The subscript notation is defined as follows: h is a household, c is a country, and t is a quarter. The dependent variable is a household-time-level dummy equal to one if household h believes prices will increase a lot over the next 12 months. $Material_{ct}$ measures the share of firms that indicate that their production is constrained by the respective constraint. The constraint is transformed from the industry-country-time level to the country-time level using the share of consumption that each industry contributes to the final household consumption. $Awareness_{hc}$ is a dummy equal to one for households with an above median within household correlation between realized inflation over the last 12 months and the household's inflation estimate for the last 12 months. $Google_{ct}$ is a country-time level variable measuring the intensity of Google searches for “delays in shipping” (in the respective country's language). $Food\ Inflation_{ct}$, $Energy\ Inflation_{ct}$, and $Core\ Inflation_{ct}$ are the country-time level CPI for food, energy, and core, respectively. $Perceived\ (realized)\ Inflation_{hct}$ is household h 's perception about the inflation over the last 12 months. Standard errors are clustered at the country-income-group level and are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	OLS		IV	
	(1) $\hat{\pi}_{ct}^e$	(2) $\hat{\pi}_{ct}^e$	(3) Material_{ct}	(4) $\hat{\pi}_{ct}^e$
Material_{ct}	0.559** (0.205)	0.533** (0.180)		
$\text{China Dependence}_{c,2019} \times \text{Lockdown Stringency}_t$			3.331*** (0.861)	
$\widehat{\text{Material}}_{ct}$				2.735*** (0.543)
$\text{Food Inflation}_{ct}$	0.091 (0.286)			
$\text{Energy Inflation}_{ct}$	-0.005 (0.044)			
$\text{Core Inflation}_{ct}$	0.437 (0.549)			
$\text{High Perception}_{ct}$		0.172** (0.077)	0.089*** (0.019)	-0.087 (0.082)
F-Test			20.6	
Observations	288	288	288	288
R-squared	0.634	0.634	0.755	
Country FE	✓	✓	✓	✓
Year FE	✓	✓		

Table OA.3: Supply chain constraint pass-through to household inflation expectations: Country-level evidence. This table presents estimation results from Specification (3) in Columns (1) and (2), where the dependent variable is the share of households that believe consumer prices will increase more rapidly at the country-time level. Columns (3) and (4) report results from the IV specification: Column (3) shows the first-stage regression, and Column (4) presents the corresponding second-stage estimates. The subscript notation is defined as follows: c is a country, and t is a quarter. Non-reported controls include the other perceived constraints to production (Labor_{ct} , Financial_{ct} , Equipment_{ct} , and Other_{ct}). Material_{ct} , Labor_{ct} , Financial_{ct} , Equipment_{ct} , and Other_{ct} measure the share of firms that indicate that their production is constrained by the respective constraint. $\text{Food Inflation}_{ct}$, $\text{Energy Inflation}_{ct}$, and $\text{Core Inflation}_{ct}$ are the country-time level CPI for food, energy, and core, respectively. $\text{High Perception}_{ct}$ is the share of households at the country-time level that believe prices have risen a lot over the last 12 months. $\text{China Dependence}_{c,2019}$ measures the exposure to inputs imported from China in 2019 at the country level. $\text{Lockdown Stringency}_t$ measures the severity of lockdown measures implemented in China's top-5 exporting provinces. Standard errors are clustered at the country level and are reported in parentheses. In Columns (1) and (2), we apply the "LZ2" bias-reduction modification of Imbens and Kolesar (2016). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	Household Price Expectations _c ²⁰²²		
	(1)	(2)	(3)
Share Services _c ²⁰¹⁹	−1.300*** (0.320)	−1.596*** (0.533)	−1.293* (0.718)
Employment growth _c ²⁰¹⁹		−2.078 (2.499)	−0.775 (3.157)
GDP Growth _c ²⁰¹⁹		−2.584 (2.622)	−3.028 (2.413)
Inflation _c ²⁰¹⁹		3.864 (4.086)	3.700 (3.829)
GDP Level _c ²⁰¹⁹			−5.433 (6.987)
Observations	17	17	17
R-squared	0.460	0.552	0.585

Table OA.4: Household inflation expectations. This table presents cross-sectional regressions (17 countries). The dependent variable is the share of households in country c that in 2022 believe consumer prices will increase more rapidly. The explanatory variables are the share of household consumption produced by the service sector, employment growth, GDP growth, overall inflation, and the log of each country’s GDP level, all measured in 2019. Standard errors in parentheses are clustered at the country level using the “LZ2” bias-reduction modification of [Imbens and Kolesar \(2016\)](#). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	Online search gap _{cy}		
	(1) Standardized	(2) Percentage points	(3) Log gap
$High\ Infl\ Exp_c \times Post_y$	-1.763* (0.860)	-5.076* (2.350)	-8.093* (3.827)
Observations	52	52	52
Countries	13	13	13
Country FE	✓	✓	✓
Post indicator	✓	✓	✓

Table OA.5: Household inflation expectations and online search for goods and services. This table reports descriptive pooled pre/post estimates at the country-year level, where c denotes a country and y a year. The underlying search measure is Eurostat’s annual share of individuals who use the internet to find information about goods and services. For each country, we estimate a pre-COVID trend over 2014–2019 and define *Online search gap_{cy}* as observed search in country c and year y relative to that trend. Column (1) reports the OLS trend residual standardized by the country’s standard deviation of search over 2014–2019, Column (2) reports the OLS trend residual in percentage points, and Column (3) reports 100 times the log deviation from a Theil–Sen trend. The estimation sample comprises 13 countries whose Eurostat search series contains no structural break between 2019 and 2022. The pre period is 2019 and the post period pools 2020–2022; observations from 2014–2018 are used only to estimate the pre-COVID trends. $Post_y$ equals one in 2020–2022 and zero in 2019. $High\ Infl\ Exp_c$ is an indicator equal to one if the increase in the share of households expecting that prices will rise more rapidly is above the median in a country between 2021:Q1 and 2022:Q1. The reported coefficient is on $High\ Infl\ Exp_c \times Post_y$. All specifications include country fixed effects. Standard errors in parentheses are clustered at the country level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	(1)	(2)	(3)	(4)	(5)
	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}
Specification	Full Sample Baseline	Demand 1-Digit	Lockdown Intensity	Household Expenditure	Realized Inflation
$\text{Service}_{pc} \times 2020_t$	-0.871 (0.725)	-1.483* (0.754)	-0.871 (0.738)	-0.880 (0.730)	-0.903 (0.701)
$\text{Service}_{pc} \times 2021_t$	-1.338** (0.524)	-1.520** (0.653)	-1.366** (0.536)	-1.335** (0.527)	-1.667*** (0.565)
$\text{Service}_{pc} \times 2022_t$	-1.594** (0.730)	-2.625*** (0.548)	-1.522* (0.768)	-1.580** (0.723)	-1.882* (0.980)
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2020_t$	0.618 (0.642)	0.805 (1.026)	0.553 (0.612)	0.623 (0.640)	0.661 (0.657)
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2021_t$	0.519 (0.380)	0.674 (0.457)	0.392 (0.359)	0.529 (0.380)	0.618 (0.366)
$\text{Service}_{pc} \times \text{High Infl Exp}_c \times 2022_t$	0.766** (0.321)	0.976* (0.521)	0.840** (0.329)	0.781** (0.324)	0.736* (0.370)
$\text{Service}_{pc} \times \text{Energy Inflation}_{ct} \times 2020_t$	0.042 (0.054)	0.134 (0.086)	0.044 (0.053)	0.042 (0.054)	0.069 (0.050)
$\text{Service}_{pc} \times \text{Energy Inflation}_{ct} \times 2021_t$	0.057* (0.028)	0.042 (0.025)	0.048 (0.030)	0.057* (0.028)	0.049* (0.026)
$\text{Service}_{pc} \times \text{Energy Inflation}_{ct} \times 2022_t$	0.043* (0.024)	0.053* (0.029)	0.041 (0.024)	0.043* (0.024)	0.038 (0.024)
$\text{Service}_{pc} \times \text{Energy Inflation}_{ct}$	-0.034 (0.023)	-0.045 (0.027)	-0.031 (0.024)	-0.034 (0.023)	-0.034 (0.023)
$\text{Energy Use}_{pc} \times \text{Energy Inflation}_{ct}$	0.010 (0.070)	-0.184** (0.078)	0.013 (0.070)	0.011 (0.071)	0.011 (0.070)
$\text{Service}_{pc} \times \text{High Lockdown}_c \times 2020_t$			1.305 (1.223)		
$\text{Service}_{pc} \times \text{High Lockdown}_c \times 2021_t$			1.554 (1.036)		
$\text{Service}_{pc} \times \text{High Lockdown}_c \times 2022_t$			0.737 (0.965)		
$\text{Service}_{pc} \times \text{Food Inflation}_{ct} \times 2020_t$					0.116 (0.272)
$\text{Service}_{pc} \times \text{Food Inflation}_{ct} \times 2021_t$					0.153 (0.256)
$\text{Service}_{pc} \times \text{Food Inflation}_{ct} \times 2022_t$					-0.136 (0.262)
$\text{Service}_{pc} \times \text{Core Inflation}_{ct} \times 2020_t$					-0.234 (0.261)
$\text{Service}_{pc} \times \text{Core Inflation}_{ct} \times 2021_t$					0.087 (0.271)
$\text{Service}_{pc} \times \text{Core Inflation}_{ct} \times 2022_t$					0.330 (0.305)
Observations	8,518	7,681	8,518	8,518	8,518
R-squared	0.589	0.785	0.590	0.589	0.591
Constraints	✓	✓	✓	✓	✓
Lockdown intensity control			✓		
Household expenditure control				✓	
Country-time FE	✓		✓	✓	✓
Product-country FE	✓	✓	✓	✓	✓
Product-time FE	✓	✓	✓	✓	✓
1-digit product-country-time FE		✓			
Realized inflation controls					✓

Table OA.6: Pass-through of supply chain constraints to generalized inflation: Demand-side controls. This table presents an extended version of the price specifications in Columns (1) and (3)–(6) of Table 5, additionally reporting the interactions with the demand-side control variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}	ΔCPI_{pct+1}
Specification	Supply t Spillover	Supply $t - 1$ Spillover	Supply $t - 2$ Spillover	Wage Level	2-year Wage Growth	1-year Wage Growth	Labor Intensity
Service _{pc} × 2020 _t	−0.702 (0.835)	−0.706 (0.876)	−0.696 (0.916)	−2.711 (1.738)	−0.042 (0.924)	−0.133 (0.878)	−0.858 (0.730)
Service _{pc} × 2021 _t	−1.448** (0.551)	−1.331** (0.561)	−1.219** (0.517)	−2.911* (1.600)	−1.090** (0.493)	−1.082* (0.547)	−1.345** (0.528)
Service _{pc} × 2022 _t	−1.746* (0.868)	−1.825* (0.882)	−1.753* (0.890)	−2.353 (1.451)	−1.382* (0.725)	−1.479* (0.824)	−1.582** (0.709)
Service _{pc} × High Infl Exp _c × 2020 _t	0.591 (0.631)	0.595 (0.618)	0.572 (0.635)	0.897 (0.739)	0.604 (0.519)	0.497 (0.483)	0.633 (0.648)
Service _{pc} × High Infl Exp _c × 2021 _t	0.503 (0.381)	0.505 (0.370)	0.491 (0.387)	0.660 (0.392)	0.596 (0.355)	0.495 (0.416)	0.521 (0.380)
Service _{pc} × High Infl Exp _c × 2022 _t	0.775** (0.338)	0.796** (0.322)	0.780** (0.334)	0.803** (0.363)	0.818** (0.314)	0.732** (0.342)	0.792** (0.338)
Material Supply _{pct} × 2020 _t	0.090 (0.136)	0.070 (0.104)	0.109 (0.104)				
Material Supply _{pct} × 2021 _t	0.026 (0.089)	−0.021 (0.080)	0.077 (0.074)				
Material Supply _{pct} × 2022 _t	−0.003 (0.077)	−0.101 (0.060)	−0.056 (0.059)				
Service _{pc} × Wage Level _{pct} × 2020 _t				0.229 (0.275)			
Service _{pc} × Wage Level _{pct} × 2021 _t				0.190 (0.167)			
Service _{pc} × Wage Level _{pct} × 2022 _t				0.007 (0.187)			
Service _{pc} × Wage Growth _{pct,F} × 2020 _t					−1.685 (4.236)	0.050 (5.184)	
Service _{pc} × Wage Growth _{pct,F} × 2021 _t					−1.612 (2.492)	3.264 (5.029)	
Service _{pc} × Wage Growth _{pct,F} × 2022 _t					−0.025 (3.191)	6.646* (3.678)	
Service _{pc} × Wage Growth _{pct,L} × 2020 _t					−12.121** (4.804)	−27.267*** (6.651)	
Service _{pc} × Wage Growth _{pct,L} × 2021 _t					−0.541 (3.474)	−3.668 (4.812)	
Service _{pc} × Wage Growth _{pct,L} × 2022 _t					−3.243 (2.414)	−7.416 (4.556)	
Service _{pc} × Labor Intensity _{pc} × 2020 _t							0.005 (0.015)
Service _{pc} × Labor Intensity _{pc} × 2021 _t							0.002 (0.007)
Service _{pc} × Labor Intensity _{pc} × 2022 _t							−0.000 (0.009)
Observations	8,518	8,518	8,518	8,502	8,518	8,518	8,518
R-squared	0.589	0.589	0.589	0.590	0.590	0.591	0.589
Constraints	✓	✓	✓	✓	✓	✓	✓
Wage level control				✓			
Wage growth control					✓	✓	
Labor intensity control							✓
Country-time FE	✓	✓	✓	✓	✓	✓	✓
Product-country FE	✓	✓	✓	✓	✓	✓	✓
Product-time FE	✓	✓	✓	✓	✓	✓	✓

Table OA.7: Pass-through of supply chain constraints to generalized inflation: Supply-side controls. This table presents an extended version of [Table 6](#), additionally reporting the interactions with the supply-side control variables.

OA.4 Theoretical framework

To examine how consumers' generalized inflation expectations influence firms' pricing behavior, we employ a duopolistic search market equilibrium model, drawing on the search model from [Benabou and Gertner \(1993\)](#) and the fairness concern framework from [Eyster et al. \(2021\)](#).

OA.4.1 Setup

There are two firms with index $i \in \{1, 2\}$, which have constant marginal costs C_i :

$$C_i = e^{\bar{c} + \theta + \gamma_i}, \quad (\text{OA.11})$$

where $\bar{c}$ is the lower bound of the marginal costs, $\theta \sim \mathcal{N}(0, \psi_\theta)$ is a common cost shock affecting both firms equally, while $\gamma_i \sim \mathcal{N}(Z_i, \psi_\gamma)$ are independent firm-specific shocks, with Z_i characterizing the extent of a firm-specific supply-side shock. The firms cannot price-discriminate, implying that each unit of their good sells at the same price, P_i .

Influence of generalized inflation expectations. Customers cannot directly observe firms' marginal production costs. Instead, they infer these costs based on the observed price and their understanding of the broader economic environment, which is shaped by their perceptions of supply-side cost shocks and the resulting inflation expectations.

We introduce a biased belief function $C_i^B(P_i)$ to formalize the belief formation process outlined in [Section 2.3](#). We then use it to examine firms' pricing strategies in response to pandemic-era supply-side shocks. This function maps the price that a monopoly with marginal costs C_i would set to consumers' biased perception of these costs as follows:

$$C_i^B(P_i) = e^{\bar{c} + \hat{\theta} + \hat{\gamma}_i}, \quad (\text{OA.12})$$

where $\hat{\theta} \sim \mathcal{N}(b_Z, \psi_\theta)$, and $\hat{\gamma}_i \sim \mathcal{N}(\max(0, Z_i - b_Z), \psi_\gamma)$ with $b_Z > 0$. This belief function captures that elevated generalized inflation expectations are associated with a tendency to misinterpret a supply-side shock affecting only certain firms as a broader shock impacting a wider range of firms. Consequently, the supply-side cost shock is at least partially attributed to a common shock, rather than being recognized as firm-specific.

OA.4.2 Effect of generalized inflation expectations on firm pricing through the price search channel

First, to build intuition about the effect of generalized inflation expectations on firm pricing via consumer search behavior, we draw on the comparative statics (Section 4, Case 1) of [Benabou and Gertner \(1993\)](#), focusing on a partial equilibrium mechanism rather than full equilibrium. There is a continuum of identical consumers, with measure normalized to one, and their demand function in absence of search is given by:

$$Y_i^d(P_i) = P_i^{-\eta}. \quad (\text{OA.13})$$

Hence, the profit function of a monopolist with cost C_i is $(P_i - C_i)Y_i^d(P_i)$, and its maximum value is given by

$$P_i^m(C_i) = \frac{\eta}{\eta - 1} \cdot C_i. \quad (\text{OA.14})$$

To study the effect of search on firm pricing, we assume that, initially, half the consumers observe firm 1's price, and the other half observe firm 2's price, at no cost. Given the observed price, each consumer decides whether to purchase at that price or search further to learn the price from the other firm. Searching entails a cost $\sigma > 0$, but it allows consumers to buy at the lower of the two prices.

Without loss of generality, let us consider consumers who first observe the price P_1 . Upon observing P_1 , they infer firm 1's underlying marginal cost structure. Using this information, they then form a posterior belief about the distribution of firm 2's price, denoted $G(P_2 | P_1)$ with density $g(P_2 | P_1)$. Based on these beliefs, the consumers then decide whether it is worthwhile to search and discover P_2 . Specifically, upon observing P_1 , consumers map this price to the biased marginal cost C_1^B and form a biased Bayesian posterior for C_2^B . This posterior is subsequently mapped to the monopoly price P_2^m that a firm with costs C_2^B would charge. For convenience, we define $c \equiv \log C$ and $p_i^m(c) \equiv \log(P_i^m(C))$.

The conditional distribution of c_2^B , given $c_1^B = c$, is normal with mean,

$$E[c_2^B | c] = \rho c + (1 - \rho) (\bar{c} + \max(b_Z, Z_2)),$$

where

$$\rho = \frac{\psi_\theta}{\psi_\theta + \psi_\gamma}, \quad (\text{OA.15})$$

and variance:

$$\text{Var}(c_2^B | c) = (1 - \rho^2)(\psi_\theta + \psi_\gamma).$$

The unconditional distribution of p_2^m is normal, with mean

$$\bar{p} \equiv \bar{c} + \max(b_Z, Z_2) + \log \left(\frac{\eta}{\eta - 1} \right). \quad (\text{OA.16})$$

Moreover, the conditional distribution of $p_2^m(c_2^B)$, given $c_1^B = c$, is normal with mean,

$$\mu(p) \equiv \rho p + (1 - \rho)\bar{p},$$

and variance:

$$s^2 \equiv (1 - \rho^2)(\psi_\theta + \psi_\gamma).$$

The expected gain from search. Let $S(p) \equiv \int_p^\infty Y_i^d(r) dr$ be the surplus that consumers derive from buying at price p ; thus:

$$S(p) = \frac{1}{\eta - 1} e^{(1-\eta)p}. \quad (\text{OA.17})$$

Therefore, after observing p_1 , consumers' expected gain from search is given by:

$$\begin{aligned} W(p_1) &= \int_{-\infty}^{p_1} [S(p_2) - S(p_1)] g(p_2 | p_1) dp_2 \\ &= \frac{1}{\eta - 1} \int_{-\infty}^{p_1} \frac{1}{\sqrt{2\pi s^2}} \{ \exp[(1 - \eta)p_2] - \exp[(1 - \eta)p_1] \} \exp \left[-\frac{(p_2 - \mu(p_1))^2}{2s^2} \right] dp_2. \end{aligned}$$

If $W(p_1) > \sigma$, a consumer chooses to search; otherwise, the consumer buys immediately at price p_1 . Moreover, define consumers' reservation price p_1^* as the smallest solution to:

$$W(p_1^*) = \sigma.$$

Accordingly, consumers are thus indifferent between searching and purchasing from firm 1

when it charges p_1^* . Let c_1^* denote the cost level such that $p_1^m(c_1^*) = p_1^*$. Consequently, if firm 1's cost level is $c_1 > c_1^*$ and it charges its monopoly price, it will induce search. Rather than incur the first-order loss in customers (who may search and potentially find a lower price), the firm opts to charge p_1^* , avoiding customer loss and experiencing only a second-order effect on profits per customer.

Rewriting the consumers' expected gain from search, $W(p_1)$, in terms of the distribution Φ of a standard normal gives:

$$\begin{aligned} W(p_1) = & \frac{1}{\eta - 1} \exp \left[-\frac{(\eta - 1)}{2} [2\bar{p} + 2\rho(p_1 - \bar{p}) - s^2(\eta - 1)] \right] \\ & \cdot \Phi \left[\frac{(1 - \rho)(p_1 - \bar{p}) + s^2(\eta - 1)}{s} \right] \\ & - \frac{1}{\eta - 1} \exp [-(\eta - 1)p_1] \cdot \Phi \left[\frac{(1 - \rho)(p_1 - \bar{p})}{s} \right]. \end{aligned} \quad (\text{OA.18})$$

Generalized inflation expectations and the perceived search value. Taking the derivative of $W(p_1)$ with respect to the extent of common shock bias b_Z yields:

$$\frac{\partial W(p_1)}{\partial b_Z} = \begin{cases} -(1 - \rho) \exp \left(-\frac{(\eta - 1)}{2} [2\bar{p} + 2\rho(p_1 - \bar{p}) - s^2(\eta - 1)] \right) \\ \quad \cdot \Phi \left(\frac{(1 - \rho)(p_1 - \bar{p}) + s^2(\eta - 1)}{s} \right) < 0 & \text{if } b_Z > Z_2, \\ 0 & \text{if } b_Z \leq Z_2. \end{cases}$$

Hence, the effect of an increase in b_Z on the search value of consumers depends on the sector and its exposure to supply-side shocks.

Consider less affected sectors, such as services, where $b_Z > Z_2$. A higher b_Z attributes more of the supply-side cost shock to a common shock across both firms. It therefore increases the mean of the conditional distribution of $p_2^m(c_2^B)$ given $p_1 = p$ and reduces the perceived option value of search. This effect arises because consumers in these sectors are effectively overestimating the average price level in the market. This dynamic reduces competitive pressure on firm 1, raising its market power. As a result, the reservation price p_1^* shifts upward, allowing firm 1 to charge higher prices without inducing consumers to search for alternatives. Correspondingly, the threshold cost level c_1^* increases, extending the range of

cost levels over which firm 1 can charge monopoly markups.

In contrast, in sectors more directly impacted by the supply-side shock—where $b_Z \leq Z_2$ (e.g., manufacturing)—this effect does not arise. The greater actual commonality in costs across firms means that consumers’ attribution of elevated costs to a shared shock is accurate. As a result, their posterior beliefs about firm 2’s prices reflect the true cost structure, leaving the reservation price p_1^* unchanged. Consequently, there is no distortion in market power, and firm 1’s pricing behavior remains unaffected by the attribution of the shock.

While we study a single product market, our findings are also applicable to multiple product markets where the consumption of different products is interconnected through a positive cross-elasticity of demand. A lower perceived option value of search reduces the cross-price elasticity of demand. This reduction, in turn, causes an upward shift in the demand curve for individual firms.

OA.4.3 Effect of generalized inflation expectations on firm pricing through the customer antagonization channel

Next, we explore how the overestimation of the magnitude of the common shock (i.e., bias $b_Z > 0$) impacts firm pricing through consumers’ fairness concerns. To study this effect, we consider a case without search, and where customers assess transactional fairness by evaluating the perceived markup charged by firms.

Consumers’ fairness concerns. There is microevidence supporting the idea that consumers care about fairness (see [Eyster et al., 2021](#) for a detailed discussion). Customers typically perceive price hikes driven by increased demand as unfair, whereas those resulting from rising costs are viewed more acceptably (e.g., [Kahneman et al., 1986](#); [Frey and Pommerehne, 1993](#); [Gielissen et al., 2008](#); and [Shiller et al., 1991](#)). Perceived unfair pricing can reduce customers’ willingness to pay (e.g., [Piron and Fernandez, 1995](#); [Rotemberg, 2005](#); [Rotemberg, 2008](#); and [Urbany et al., 1989](#)). Firms also recognize that customers respond negatively to markups perceived as unfair (e.g., [Blinder et al., 1998](#) and [Eyster et al., 2021](#)).

To capture consumers’ fairness concerns, we assume that the perceived markup over perceived costs determines a transaction’s perceived fairness. We represent fairness with a twice differentiable function $F(M^B)$. The function is positive, strictly decreasing, and weakly concave over $[0, M^h]$, where $F(M^h) = 0$ and $M^h > \eta/(\eta - 1)$. The decreasing nature

of F reflects customers' aversion to higher markups, while its weak concavity implies that increases in perceived markup lead to a utility loss at least as large as the utility gain from an equal-sized decrease in the perceived markup.

Generalized inflation expectations are associated with consumers' overestimation of the magnitude of the common shock, which influences their fairness assessments. Specifically, consumers form biased beliefs about firms' marginal costs and infer the firms' markup accordingly. Given these biased perceptions, consumers infer that the markup is as follows:

$$M^B(P_i) = \frac{P_i}{E[CB(P_i)]}. \quad (\text{OA.19})$$

A customer who purchases quantity Y_i of the good at price P_i thus experiences the following fairness-adjusted consumption:

$$A = F(M^B(P_i)) \cdot Y_i.$$

Customers also face a budget constraint:

$$P_i \cdot Y_i + B = I,$$

where $I > 0$ represents initial wealth, and B denotes remaining money balances. Fairness-adjusted consumption and money balances are incorporated into a quasilinear utility function:

$$\frac{\eta}{\eta - 1} \cdot A^{(\eta-1)/\eta} + B,$$

where the parameter $\eta > 1$ governs the concavity of the utility function. Given the fairness factor F and price P_i , customers choose their purchases Y_i and money balances B to maximize utility, subject to the budget constraint:

$$\frac{\eta}{\eta - 1} (F \cdot Y_i)^{(\eta-1)/\eta} + I - P_i \cdot Y_i.$$

The maximum of the customers' utility function is determined by the following first-order condition (FOC):

$$F^{(\eta-1)/\eta} \cdot Y_i^{-1/\eta} = P_i,$$

which yields the following demand function:

$$Y_i^d(P_i) = P_i^{-\eta} \cdot F(M^B(P_i))^{\eta-1}. \quad (\text{OA.20})$$

The price affects demand through two channels: the typical substitution effect, represented by $P_i^{-\eta}$, and the customer antagonization channel, captured by $F(M^B(P_i))^{\eta-1}$. The customer antagonization channel arises because the price influences the perceived markup, and thus the perceived fairness of the transaction; this, in turn, impacts the marginal utility of consumption and, consequently, demand.

Firm pricing under fairness concerns. When firms set prices under fairness concerns, they need to account for how the perceived fairness of their markups influences customers' willingness to pay. Consequently, firms must balance the direct impact of the price on profit margins with the indirect effect of perceived fairness on the demand elasticity.

Specifically, in the absence of search, the two firms set price P_i and output Y_i to maximize profits $(P_i - C_i) \cdot Y_i^d(P_i)$, subject to customers' demand for their good. The resulting FOC is:

$$Y_i^d(P_i) + (P_i - C_i) \frac{dY_i^d}{dP_i} = 0. \quad (\text{OA.21})$$

We introduce the price elasticity of demand, normalized to be positive:

$$E_i = -\frac{d \ln(Y_i^d)}{d \ln(P_i)} = -\frac{P_i}{Y_i^d} \cdot \frac{dY_i^d}{dP_i},$$

which implies together with the FOC from Eq. (OA.21) for the monopoly price that

$$P_i^m(C_i) = \frac{E_i}{E_i - 1} \cdot C_i. \quad (\text{OA.22})$$

From Eq. (OA.20), we find the elasticity E :

$$E_i = \eta + (\eta - 1) \cdot \phi(M^B) > \eta, \quad (\text{OA.23})$$

where

$$\phi(M^B) = -\frac{d \ln(F)}{d \ln(M^B)}$$

is the elasticity of the fairness function with respect to the perceived markup. The properties of the fairness function F imply the following lemma (for the proof, please refer to Online Appendix A of [Eyster et al., 2021](#)).

Lemma 1. *The elasticity of the fairness function $\phi(M^B)$ is strictly positive and strictly increasing on $(0, M^h)$, with $\lim_{M^B \rightarrow 0} \phi(M^B) = 0$ and $\lim_{M^B \rightarrow M^h} \phi(M^B) = +\infty$. As an implication, the superelasticity of the fairness function*

$$\kappa = \frac{d \ln(\phi)}{d \ln(M^B)}$$

is strictly positive on $(0, M^h)$.

The second term in Eq. (OA.23), $(\eta - 1) \cdot \phi$, represents the customer antagonization channel, which implies that higher perceived marginal costs and a lower price reduce the perceived markup, thereby increasing the perceived fairness and lowering the price elasticity of demand.

From Eq. (OA.22) and Eq. (OA.23) it follows that the firms' monopoly price is given by

$$P_i^m = \left(\frac{\eta + (\eta - 1)\phi}{(\eta - 1)(1 + \phi)} \right) \cdot C_i. \quad (\text{OA.24})$$

Generalized inflation expectations and price elasticity of demand. Next, we investigate the effect of consumers' overestimation of the common cost shock, b_Z , on optimal firm pricing. To this end, we calculate the derivative of P_i^m with respect to b_Z using the chain rule, as ϕ depends on the perceived markup M^B , which in turn is influenced by b_Z :

$$\frac{dP_i^m}{db_Z} = \frac{dP_i^m}{d\phi} \cdot \frac{d\phi}{db_Z}, \quad (\text{OA.25})$$

where the derivative of P_i^m with respect to ϕ is given by:

$$\frac{dP_i^m}{d\phi} = -\frac{C_i}{(\eta - 1)(1 + \phi)^2} < 0. \quad (\text{OA.26})$$

Plugging Eq. (OA.26) into Eq. (OA.25) yields:

$$\frac{dP_i^m}{db_Z} = -\frac{C_i}{(\eta-1)(1+\phi)^2} \cdot \frac{d\phi}{db_Z}. \quad (\text{OA.27})$$

Hence, to determine the sign of dP_i^m/db_Z , we next need to establish the sign of $d\phi/db_Z$. Since ϕ depends on b_Z via the perceived markup given in Eq. (OA.19), we have:

$$\frac{d\phi}{db_Z} = \frac{d\phi}{dM^B(P_i)} \cdot \frac{dM^B(P_i)}{db_Z}, \quad (\text{OA.28})$$

for which we know that $d\phi/dM^B(P_i) > 0$ from Lemma 1. To determine $dM^B(P_i)/db_Z$, we first substitute the actual and perceived marginal costs into Eq. (OA.19), which, after simplification, yields:

$$M^B(P_i) = \left(\frac{\eta + (\eta-1)\phi}{(\eta-1)(1+\phi)} \right) \cdot e^{-b_Z}. \quad (\text{OA.29})$$

The derivative of $M^B(P_i)$ with respect to b_Z is given by:

$$\frac{dM^B(P_i)}{db_Z} = \begin{cases} -\left(\frac{1}{(\eta-1)(1+\phi)^2} \cdot \frac{d\phi}{db_Z} + \frac{\eta+(\eta-1)\phi}{(\eta-1)(1+\phi)} \right) \cdot e^{-b_Z} & \text{if } b_Z > Z_i, \\ 0 & \text{if } b_Z \leq Z_i. \end{cases} \quad (\text{OA.30})$$

Substituting Eq. (OA.28) into Eq. (OA.30) and solving for $dM^B(P_i)/db_Z$ yields

$$\frac{dM^B(P_i)}{db_Z} = \begin{cases} -\frac{\left(\frac{\eta+(\eta-1)\phi}{(\eta-1)(1+\phi)} \right) \cdot e^{-b_Z}}{1 + \frac{e^{-b_Z}}{(\eta-1)(1+\phi)^2} \cdot \frac{d\phi}{dM^B(P_i)}} < 0 & \text{if } b_Z > Z_i, \\ 0 & \text{if } b_Z \leq Z_i. \end{cases} \quad (\text{OA.31})$$

Eq. (OA.31) together with Eq. (OA.28) imply that $d\phi/db_Z < 0$ if $b_Z > Z_i$, which in turn implies that $dE/db_Z < 0$ (see Eq. OA.23) and that $dP_i^m/db_Z > 0$ (see Eq. OA.27). Therefore, the overestimation of the common cost shock magnitude, b_Z , reduces the price elasticity of demand E whenever $b_Z > Z_i$ due to consumers' fairness concerns, prompting firms to set higher prices.

Finally, we determine the derivative of the actual markup with respect to b_Z . Plugging

the price P_i^m from Eq. (OA.24) into the actual markup (P_i/C_i) yields:

$$M_i = \frac{P_i}{C_i} = \left(\frac{\eta + (\eta - 1)\phi}{(\eta - 1)(1 + \phi)} \right); \quad (\text{OA.32})$$

thus, the derivative of M_i with respect to b_Z is given by:

$$\frac{dM_i}{db_Z} = \frac{dM_i}{d\phi} \cdot \frac{d\phi}{db_Z},$$

since ϕ again depends on the perceived markup, which depends on b_Z . Taking the derivative of M_i with respect to ϕ yields:

$$\frac{dM_i}{d\phi} = -\frac{1}{(\eta - 1)(1 + \phi)^2} < 0. \quad (\text{OA.33})$$

Hence, the derivative of M_i with respect to b_Z is:

$$\frac{dM_i}{db_Z} = \begin{cases} -\frac{1}{(\eta - 1)(1 + \phi)^2} \cdot \frac{d\phi}{db_Z} > 0 & \text{if } b_Z > Z_i, \\ 0 & \text{if } b_Z \leq Z_i. \end{cases} \quad (\text{OA.34})$$

Therefore, the overestimation of the size of the common cost shock, b_Z , also increases the actual markup charged by firms in the absence of search if $b_Z > Z_i$.

In summary, when consumers have elevated generalized inflation expectations, they attribute higher prices to broader market-wide cost increases, which reduces their perception of unfairness in pricing. This shift lowers the price elasticity of demand, as consumers become less responsive to price hikes. Firms capitalize on this reduced elasticity by increasing their markups and prices. These effects are again more pronounced in sectors less affected by supply-side shocks.