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When Global Energy Costs Travel: Domestic Trade Network Channel to Inflation Expectations

By *Dimitris K. Chronopoulos, Selçuk Gül, Abdullah Kazdal, John O.S. Wilson, Muhammed Hasan Yılmaz*

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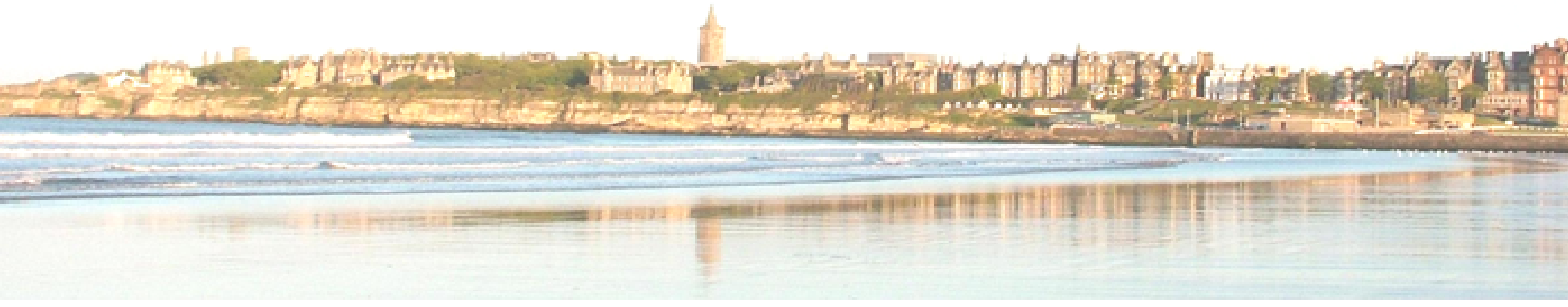
WP N° 26-008

1st Quarter 2026



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When Global Energy Costs Travel:

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Dimitris K. Chronopoulos[*] Selçuk Gül[†] Abdullah Kazdal[‡]

John O.S. Wilson[§] Muhammed Hasan Yılmaz[**]

Abstract

Global energy price shocks can destabilise inflation expectations, with profound implications for monetary policy and price stability. In this paper we investigate how energy exposure in domestic supply chains shape the transmission of global energy price shocks to firm-level inflation expectations. Using administrative microdata for Türkiye, we show that firms more reliant on energy inputs within their trade networks exhibit stronger responses in medium term consumer and producer price expectations. These effects are most pronounced among larger, more leveraged and higher-employment firms. Firms with a higher level of dependency are also more likely to revise pricing and unit cost expectations following energy price increases. Our results highlight the role of domestic supply chain energy exposures in shaping inflation dynamics in emerging markets amid global commodity fluctuations.

JEL Codes: E31, Q41, L14, D22

Keywords: Global Energy Prices, Energy Exposure, Trade Network, Price Stability, Inflation Expectations

1. Introduction

[*] Centre for Responsible Banking & Finance, University of St Andrews, Gateway Building, St Andrews, Fife, KY16 9RJ, Scotland, UK. Email: dc45@st-andrews.ac.uk

[†] Central Bank of the Republic of Türkiye, İstanbul Financial Center, Ümraniye, 34760, İstanbul, Türkiye. E-mail: selcuk.gul@tcmb.gov.tr

[‡] Central Bank of the Republic of Türkiye, İstanbul Financial Center, Ümraniye, 34760, İstanbul, Türkiye.
E-mail: abdullah.kazdal@tcmb.gov.tr

[§] Centre for Responsible Banking & Finance, University of St Andrews, Gateway Building, St Andrews, Fife, KY16 9RJ, Scotland, UK. Email: jsw7@st-andrews.ac.uk (Corresponding Author)

[**] Central Bank of the Republic of Türkiye, İstanbul Financial Center, Ümraniye, 34760, İstanbul, Türkiye and Centre for Responsible Banking & Finance, University of St Andrews, Gateway Building, St Andrews, Fife, KY16 9RJ, Scotland, UK.
Email: muhammed.yilmaz@tcmb.gov.tr

Episodes of large and persistent movements in global energy prices have been a defining feature of the post-2000 macroeconomic environment. Examples include the surge in oil and natural gas prices around the global financial crisis, during the 2010s commodity super-cycle, and again in the wake of the Russia–Ukraine conflict. These shocks have reignited long standing discussions regarding how energy prices transmit into inflation and real economic activity, particularly in energy-importing emerging markets. Against this background, in this study, we investigate how energy exposure in domestic supply chains shape the transmission of global energy price shocks to firm-level inflation expectations.

A considerable macroeconomics literature documents that oil and energy price shocks can have significant and long-lasting impacts on output and inflation. The absolute magnitude and persistence depend upon the nature of the shock, the structure of the economy and the monetary policy regime (Hamilton, 1983, 2003; Rotemberg and Woodford, 1996; Bernanke et al., 1997; Barsky and Kilian, 2002; Hooker, 2002; Blanchard and Galí, 2007; Kilian, 2009). Prior research using structural VARs and news-based identification further highlight the role of oil supply and demand shocks in driving output, economic activity, inflation and currency movements (Baumeister and Peersman, 2013; Baumeister and Hamilton, 2019; Känzig, 2021). Understanding this transmission is critical, given that energy price shocks can rapidly destabilise inflation expectations, amplifying macroeconomic volatility and complicating policy responses in energy-importing economies.

For inflation-targeting central banks and monetary authorities, the impact of energy price shocks is crucial not only because of the first-round impacts on energy and transport prices, but also because of their potential to de-anchor inflation expectations and trigger second-round wage–price dynamics. The modern expectations-augmented Phillips curve emphasises the significant role of expectations in inflation dynamics (Mankiw and Reis, 2002; Coibion and Gorodnichenko, 2015a, 2015b; Coibion et al., 2018). Survey-based studies show that firm and household expectations are often biased, sticky and heterogeneous. Yet provide crucial information regarding forward-looking behaviour in relation to product pricing, wage determination, labour supply, inventory management, credit utilisation, investment tendencies and other strategic decisions (Coibion et al., 2020; Weber et al., 2022). Related evidence links energy prices to expectations. Binder (2018), Kilian and Zhou (2022), Wong (2015) and Aastveit et al. (2023) collectively document that movements in oil and gasoline prices affect household and firm inflation expectations. Wehrhöfer (2023), Adams and Barrett (2024) and Patzelt and Reis (2024) show that recent energy-related shocks have contributed to an increase in measured expectations in advanced economies.

Türkiye (the setting for the present study) provides a useful laboratory for studying the expectations channel of energy price shocks. The Turkish economy is structurally dependent on imported energy. Moreover, exchange rate and energy price (cost) shocks have historically played prominent roles in bouts of inflation. A growing body of evidence quantifies the pass-through of international oil prices to domestic prices at various stages of the supply chain. Akçelik et al. (2016) show that crude oil price changes quickly transmit into domestic fuel prices, and estimate that a 10 percent permanent increase in oil prices raises consumer inflation by around 0.5 percentage points, with an even stronger effect on producer prices. Özmen and Özşahin (2023) document that global energy and non-energy commodity prices exert time-varying and substantive impacts on Türkiye's inflation over 2003–2022. Thus highlighting the macroeconomic salience of energy price shocks for an energy-importing emerging market. Overall, Türkiye's structural energy dependence and history of inflationary episodes provide an ideal setting to uncover how global shocks propagate through domestic cost structures and expectations.

The literature on energy economics often relies upon aggregated data and treats the setting as a small open economy impacted by exogenous global energy price shocks. Production-network models instead emphasise that macroeconomic responses to sectoral shocks depend on the structure of inter-firm and inter-sectoral linkages (Acemoglu et al., 2012; Carvalho, 2014; Carvalho and Tahbaz-Salehi, 2019; Barrot and Sauvagnat, 2016). Shocks impacting energy-intensive industries can cascade through input–output networks and generate outsized aggregate effects relative to their share in value added. Firm-level studies on the propagation of energy input cost shocks document heterogeneous pass-through across firms when energy or carbon prices change (Ganapati et al., 2020; Colmer et al., 2025). This suggests that the impact of global energy prices on firms' costs and expectations depend not only on their own direct energy usage, but also on their position in domestic supplier networks and the energy intensity of their upstream partners.

An expanding literature utilises micro data on expectations to study how firms and households perceive and respond to macroeconomic shocks. For advanced economies, firm managers and household inflation expectations are often poorly anchored, but nevertheless are strongly predictive of price changes, employment and investment. These expectations also tend to be moved frequently by information and communications (Coibion and Gorodnichenko, 2015a, 2015b; Coibion et al., 2020; Weber et al., 2022). Kose et al. (2019) review the measurement of expectations and their role in monetary policy across advanced and emerging economies. The authors show that expectations in emerging markets tend to be more backward-looking and sensitive to relative-price shocks.

For Türkiye, there is a substantive, albeit aggregate-based literature on inflation expectations.[1] These studies confirm the significant role of expectations in the Turkish inflation process, but focus on professional or aggregate expectations. As such they do not explicitly incorporate firms' heterogeneous energy exposures or their positions in domestic production networks. Our study brings together three strands of literature on energy price shocks, production networks and firm-level inflation expectations, by using a novel micro dataset for Türkiye. We combine an unbalanced monthly panel of manufacturing firms from the Central Bank of the Republic of Türkiye (CBRT) Business Tendency Survey over 2009–2023 with an administrative firm-to-firm transactions database and firm-level financial statements. The transaction data allow us to construct a time-varying measure of each firm's energy exposure in domestic supply chains, defined as the share of purchases sourced (directly or indirectly) from energy-intensive suppliers and sectors. We complement this with detailed firm-level information on size, leverage, employment and trade orientation to study heterogeneity in the transmission of global energy shocks.

We estimate a saturated panel model in which several expectation outcomes at the firm level are regressed on global energy prices interacted with firm-specific energy exposure. The outcome variables capture: 12-month-ahead expectations for consumer and producer price inflation (measured as continuous percentages); and binary indicators for whether firms expect their own unit prices and unit costs to increase over the next three months. The main explanatory variables are: the log level of global oil and alternative energy price indices; the firm-level energy exposure measure; and their respective interaction. Our baseline specification includes firm fixed effects to absorb time-invariant firm characteristics and sector-by-month fixed effects (at the 4-digit NACE level) to capture sector-specific and seasonal shocks. This design exploits within-firm variation over time in global energy prices and in firms' position in energy-intensive domestic trade networks to trace how cost shocks feed into expectations.

By way of preview, our results suggest that the impact of global energy price shocks on expectations is more pronounced for firms that are more reliant on energy-intensive inputs in domestic trade networks. An increase in global oil prices leads highly exposed firms to revise

[1] Using panel data on financial and real sector expectations, Oral et al. (2011) test the rationality of Turkish inflation expectations. The authors present evidence of systematic biases and persistence. Soybilgen and Yazgan (2017) evaluate the forecast performance of expectations via survey-based data. Koç et al. (2021) estimates a joint system of inflation and expectations equations and show that expectations have become more important in Turkish inflation dynamics and are affected by inflation targets, realised inflation, exchange rate movements and oil prices. Gülşen and Kara (2021) study the changing behaviour of professional forecasters' expectations with evolving macroeconomic and policy performance. Akarsu et al. (2025) show that central bank communication and policy actions can shape expectations of households, firms and market participants in Türkiye.

up their 12-month-ahead CPI and PPI expectations by more than otherwise similar, but less exposed counterparts. Moreover, these firms are more likely to report expectations of increasing unit prices and unit costs over the next three months. This pattern is robust across: alternative measures of expectations; different energy price indicators; and after controlling for non-energy commodity prices. We further show that the transmission of energy shocks to expectations is stronger for larger, more leveraged and higher-employment firms. This suggests that network-based energy exposure interacts with firm balance-sheet conditions in shaping expectation formation. Overall, these findings reveal that energy-dependent production structures are not passive recipients of global shocks, but instead are conduits that magnify their impact on inflation expectations, with resultant consequences and implications for macroeconomic stability and public policy.

Our paper makes three contributions to the literature. First, we provide (to our knowledge), the first firm-level evidence on how global energy price shocks transmit into inflation expectations through domestic production networks for an emerging market. Thus complementing aggregate studies of energy pass-through to inflation in Türkiye (Akçelik et al., 2016; Özmen and Özşahin, 2023). Second, we contribute to the broader literature on firm expectations by documenting a novel form of heterogeneity. Specifically, firm expectations respond more to energy shocks when they are more exposed to energy-intensive suppliers upstream in the domestic network, even after conditioning on sector and size. This connects the micro-expectations literature (Coibion et al., 2020; Weber et al., 2022) with production-network models of shock propagation (Acemoglu et al., 2012; Carvalho and Tahbaz-Salehi, 2019). Third, by focusing on Türkiye's inflation-targeting period and episodes of elevated inflation and energy price volatility, we augment evidence on how expectations in emerging markets react to relative-price and cost-push shocks, with implications for the calibration and communication of monetary policy.

The remainder of the paper is organised as follows. Section 2 describes the institutional background, data sources and the construction of our firm-level energy exposure measure. Section 3 outlines the empirical strategy linking global energy prices, domestic trade-network exposure and firm-level expectations. Section 4 presents the main results, robustness checks and heterogeneity analyses. Section 5 concludes with policy implications for inflation-targeting central banks in energy-importing emerging markets.

2. Data

Our sample comprises an unbalanced panel of 3,724 manufacturing firms over the period January 2009 to December 2023. The empirical analysis (presented in Section 4) combines several administrative and publicly available datasets. First, we use the Business Tendency

Survey (BTS) to obtain firms' inflation expectations. Conducted by the CBRT, the BTS monitors managers' assessments of recent performance and current conditions, as well as expectations regarding sales, production, pricing, and export activity. The survey enables the construction of backward- and forward-looking indicators for manufacturing sector conditions. In this framework, we collect firms' quantitative 12-month-ahead forecasts for consumer and producer inflation, along with their categorical three-month-ahead evaluations of expected changes in unit prices and costs. These qualitative responses are grouped as "increase," "decrease," or "remain the same."

Second, we employ the micro-level firm-to-firm transactions database compiled by the Revenue Administration (accessed via the CBRT) to characterise supply chain relationships. This dataset records all domestic trade among Turkish firms with invoice values above TL5,000 and allows us to identify linkages between firms. We aggregate these transactions to measure each firm's exposure to energy inputs, calculated as the annual share of purchases from firms operating in electricity, natural gas, and petroleum sectors in total inputs. The input supplier sectors according to 4-digit NACE REV.2 classification are: 3514 - Trade of electricity; 3523 - Trade of gas through mains; and 4671 - Wholesale of solid, liquid and gaseous fuels and related products.

Third, we incorporate firm characteristics from annual financial statements submitted to the Revenue Administration (and accessed via the CBRT). These regulatory filings (which are prepared under the Tax Procedure Law) require all corporate taxpayers to report balance sheets, income statements, and supplementary information. From these records, we obtain data on firm size classifications, number of employees, total assets, and financial liabilities. Fourth, we collect time-series data on global commodity price movements. Brent oil prices from Bloomberg serve as our main proxy for global energy shocks. In addition to Brent oil prices, we also incorporate alternative commodity benchmarks including European TTF Natural Gas prices as well as Goldman Sachs Agriculture and Industrial Metal Indices obtained from Bloomberg, which we later use in extended analyses.

Overall, the micro-level datasets (on firm expectations from the CBRT Business Tendency Survey, detailed supply-chain linkages from administrative transaction records, firm characteristics from financial statements, and global commodity price indicators) underpinning the empirical analysis (presented in section 4) allow us to construct a time-varying measure of energy exposure and link it to expectation formation. Building on this foundation, the next section introduces our empirical strategy, which leverages these data to identify how global energy shocks interact with domestic trade-network structures to shape the inflation expectations of firms.

3. Empirical Design

Our baseline specification for empirical analysis is defined as follows:

$$Expectations_{i,t} = \beta_1\left(Brent\ Oil\ Price_t\ x\ Energy\ Exposure_{i,t-12}\right) + \beta_2(Brent\ Oil\ Price_t) + \beta_3\left(Energy\ Exposure_{i,t-12}\right) + \delta_i + \delta_{st} + \varepsilon_{i,t} \quad (1)$$

where $Expectations$ stands for the different outcome variables describing expectation formation of firm i observed at time t concerning 12 months ahead inflation rate ($CPI\ Expectations$ and $PPI\ Expectations$) as well as binary variables representing the likelihood of increase in unit price and cost ($Unit\ Price\ Expectations$ and $Unit\ Cost\ Expectations$). The variable $Brent\ Oil\ Price$ shows the log-transformed level of global oil prices, while the variable $Energy\ Exposure$ measures (one year-lagged) annual energy dependency of firms based on supply chain activities. The main coefficient of interest, β_1, gauges the extent to which energy dependency in domestic trade network facilitates the transmission of global energy shocks to firms' inflation expectations. The specification in Equation (1) is saturated with firm fixed effects (δ_i) to account for unobserved firm-level time-invariant heterogeneities that are likely to affect expectation formation. The model is also augmented with sector-by-month fixed effects (δ_{st}) to absorb time-varying macro-level and sectoral forces, where sector definitions are determined as 4-digit NACE classifications. Standard errors are clustered at firm level.

Overall, our empirical framework combines global energy price movements with firm-specific energy exposure to identify how supply-chain structures condition expectation responses. The next section applies this model to the Turkish firm-level data, presenting baseline estimates, robustness checks, and heterogeneity patterns that reveal the strength and channels of this transmission.

4. Results

The baseline estimates in Table 1 show that global energy price shocks translate into increases in firm-level inflation expectations in a way that is systematically shaped by firms' energy exposure in domestic supply chains. Across all specifications, the interaction between Brent oil prices and firm-specific energy exposure is positive and significant, implying that firms with a higher share of energy inputs revise expectations more strongly in response to global price movements than firms with lower exposure. The regressions for unit price and cost

expectations yield comparable dynamics, indicating that the same mechanism operates in near-term pricing plans and cost predictions for firms' own operations. These findings are consistent with the view that energy-dependent production structures amplify the pass-through of global price shocks into expectation formation and pricing behaviour. This interpretation aligns with recent evidence showing that firms adjust inflation expectations and pricing intentions rapidly following input-cost shocks (De Fiore et al., 2025; Gödl-Hanisch and Menkhoff, 2023).

[***Insert Table 1 Here***]

Recent firm-level studies corroborate the asymmetric and state-dependent nature of cost-pass-through. Using Italian firm survey data, De Fiore et al. (2025) show that positive cost shocks raise inflation expectations more than equivalent negative shocks, while Gödl-Hanisch and Menkhoff (2023) document significant heterogeneity across firms and sectors in the responsiveness to cost-push shocks. The estimates for Turkish case extend this evidence by demonstrating that heterogeneity in expectation pass-through is not only present, but structurally linked to an objective measure of energy exposure derived from administrative trade-network data rather than self-reported shock assessments. This structural linkage highlights that expectation formation is not merely behavioural, but rather is related to production-network characteristics. Consequently, highlighting the need to examine the mechanisms via which these channels amplify global shocks.

We subject our baseline findings to various checks. Using alternative energy price measures and additional controls of global commodity prices, we confirm that our baseline findings are not an artefact of a particular specification. When natural gas replaces oil as the benchmark energy price (Table 2), the interaction estimates remain positive and economically relevant, indicating that amplification is not specific to the oil market. Incorporating global agricultural and non-industrial metal price indices (Table 3) leaves the energy-exposure coefficients unchanged, and produces slightly larger coefficients in the CPI and PPI specifications. This is suggestive of a distinct role for energy rather than a general commodity-price effect.[2]

[***Insert Tables 2 and 3 Here***]

[2] For the robustness pertaining to other commodity prices, we undertake an auxiliary analysis. First, we regress global agricultural product prices on Brent oil prices, global non-industry metal prices and time trend. Then, we take the residual of this first-stage regression as a control variable representing the genuine agricultural product price shocks. Second, we repeat the same process by regressing global non-industry metal prices on Brent oil prices, global agricultural product prices and time trend in order to construct another control variable in a similar manner. Finally, we re-run our baseline estimations by augmenting the specification with the aforementioned synthesized controls.

The magnitude and consistency of responses in Türkiye contrast with estimates produced by prior studies for advanced economies. Using German survey data, Wehrhöfer (2023) observes robust expectation responses among households, but weaker effects for firms. In contrast, Turkish data reveals pronounced adjustments by firms when energy exposure is high. This discrepancy may reflect: the higher salience of energy shocks in emerging-market settings; the prevalence of cost-plus pricing under high inflation; or the use of administrative input-flow data used in the present study (rather than the self-reported shock exposure measures used elsewhere).

The heterogeneity analysis reported in Figures 1 and 2 provide additional insights into the channels through which firm characteristics condition the strength of the energy-exposure effect. These figures split the sample by size (large versus non-large firms based on: regulatory classification); employment (above- versus below-median number of employees); and financial leverage (above- versus below-median financial liabilities to asset ratio), and then re-estimated the baseline model used in columns (1) and (2) of Table 1. In each dimension, the estimated interaction between global energy prices and energy exposure is higher for large firms, high-employment firms, and highly leveraged firms than for their counterparts. This pattern suggests that network-based energy exposure does not operate in isolation, but rather interacts with firm characteristics that amplify vulnerability to global shocks. The stronger responsiveness among large, highly leveraged, and high-employment firms suggests that these firms play a particularly significant role in magnifying the macroeconomic impact of energy price volatility.

[***Insert Figures* 1 *and* 2 *Here***]

While network centrality provides one plausible channel behind the stronger sensitivity of large and high-employment firms to global energy shocks, several additional mechanisms may reinforce this pattern. Firms operating extensive capital-intensive production technologies may experience a disproportionately substantial increase in marginal costs when energy prices increase. This is consistent with evidence showing higher pass-through among energy- and capital-intensive manufacturers (Lafrogne-Joussier et al., 2023). Limited short-run substitutability of energy inputs may further constrain adjustment margins for large production lines, echoing findings on low substitution elasticities in energy-intensive sectors (Bun et al., 2023). Larger firms may also process global information and commodity signals more quickly, due to dedicated forecasting capacity and greater exposure to international markets. This is consistent with prior research findings that link expectation responsiveness to information acquisition (Coibion et al., 2020). Finally, firms with greater pricing power or market dominance may internalize external shocks into pricing plans more confidently increasing expectations markedly because they anticipate successful pass-through. This interpretation aligns with firm-

level experimental evidence on cost-shock pass-through (De Fiore et al., 2025; Gödl-Hanisch & Menkhoff, 2023). Taken together, the stronger amplification observed in Figures 1 and 2 may reflect not only supply-network centrality, but also capital intensity, substitution rigidity, information advantage, and pricing-power channels, each of which predicts larger expectation responses among energy-dependent large firms.

Second, the leverage dimension points to a financial-constraints channel. More leveraged firms face tighter cash-flow and financing constraints, so energy cost increases reduce internal funds and borrowing capacity more sharply. Evidence from firm-level studies suggests that financially fragile firms exhibit stronger cost pass-through to prices and greater sensitivity of their expectations to shocks (Demir et al., 2024; Berardi, 2024). The Turkish results align with this pattern. Among energy-dependent firms, those with higher leverage have CPI and PPI expectations that move closely with changes in global energy prices. This suggests that these firms have limited scope to absorb shocks in their respective margins.

Finally, the Turkish results connect directly to an emerging body of research linking energy shocks to firm-level inflation expectations (Wehrhöfer, 2023; Baumann et al., 2024; Mello, 2025). In line with this literature, exposure matters. However, in contrast to most Euro-Area evidence (where pass-through is often moderate or episodic), the amplification in Türkiye is strong, persistent, and associated with the heavy dependence of economic activity on imported energy sources. The evidence therefore suggests that energy shocks play a first-order role not only in realised cost inflation, but also in firms' belief formation, particularly among large, high-employment, and financially constrained manufacturers.

5. Conclusion

This study uses high-frequency survey data and administrative supply-chain linkages from Turkish manufacturing firms to investigate how global energy shocks shape inflation expectations at the firm level. Our analysis employs a saturated panel model with fixed effects to trace how global energy shocks interact with domestic network exposure in shaping inflation expectations. The results show that energy price increases are not passively absorbed across firms, but instead trigger expectation revisions that are systematically conditioned by firms' energy intensity, size, financial leverage, and supply-chain centrality. These findings highlight that energy-dependent production structures serve as transmission channels through which global shocks permeate domestic price-setting behaviour. Thus, firm heterogeneity becomes central to understanding inflation dynamics in emerging-market settings.

The observed amplification among large, high-employment and highly leveraged firms suggests that production-network position and financial capacity are among important determinants of shock transmission. These firms are not only more exposed to energy costs, but are also likely to hold more pricing power and exert broader macroeconomic influence. Such microeconomic structures can thus magnify the pass-through of global shocks to domestic inflation expectations. Hence, aggregate inflation may be disproportionately shaped by a subset of exposed firms rather than representative averages.

These insights carry important implications for macroeconomic stability in emerging markets. In economies such as Türkiye that rely on imported energy, sudden and unexpected increases in global energy costs can quickly de-anchor inflation expectations among firms. This in turn has the potential to fuel broader price pressures and complicate price stabilisation efforts. For inflation-targeting central banks, this implies the need to proactively anchor expectations in the face of commodity shocks. For example, through communication that distinguishes temporary cost swings from sustained inflationary trends. Macroeconomic forecasting and policy practices should incorporate firms' varying energy exposures and financial constraints in order to anticipate more accurately aggregate inflation dynamics. By recognizing which sectors and firms are most vulnerable to global energy fluctuations, policymakers can calibrate more effective responses to maintain price stability.

References

Aastveit, K. A., Bjørnland, H. C., & Cross, J. L. (2023). Inflation expectations and the pass-through of oil prices. *Review of Economics and Statistics, 105*(3), 733–743.

Acemoglu, D., Carvalho, V. M., Ozdaglar, A., & Tahbaz-Salehi, A. (2012). The network origins of aggregate fluctuations. *Econometrica, 80*(5), 1977–2016.

Adams, J. J., & Barrett, P. (2024). Shocks to inflation expectations. *Review of Economic Dynamics, 54* (1),101234

Akarsu, O., Aktug, E., & Yalçın, C. (2025). Do central banks shape expectations? Evidence from households, firms and market participants. *A*vailable at SSRN: https://ssrn.com/abstract=5140085

Akçelik, F., & Öğünç, F. (2016). Pass-through of crude oil prices at different stages in Turkey. *Central Bank Review, 16*(1), 41-51.

Barrot, J.-N., & Sauvagnat, J. (2016). Input specificity and the propagation of idiosyncratic shocks in production networks. *Quarterly Journal of Economics, 131*(3), 1543–1592.

Barsky, R. B., & Kilian, L. (2002). Oil and the macroeconomy since the 1970s. *Journal of Economic Perspectives, 18*(4), 115–134.

Baumann, U., Ferrando, A., Georgarakos, D., Gorodnichenko, Y., & Reinelt, T. (2024). SAFE to Update Inflation Expectations? New Survey Evidence on Euro Area Firms, *National Bureau of Economic Research Working Paper.* Number w32504.

Baumeister, C., & Hamilton, J. D. (2019). Structural interpretation of vector autoregressions with incomplete identification: Revisiting the role of oil supply and demand shocks. *American Economic Review, 109*(5), 1873–1910.

Baumeister, C., & Peersman, G. (2013). Time-varying effects of oil supply shocks on the US economy. *American Economic Journal: Macroeconomics, 5*(4), 1–28.

Berardi, N. (2024) R(a)ising Prices While Struggling: Firms' Financial Constraints and Price Setting. *Banque de France Working Paper,* Number 942.

Bernanke, B. S., Gertler, M., & Watson, M. (1997). Systematic monetary policy and the effects of oil price shocks. *Brookings Papers on Economic Activity, 28*(1), 91–157.

Binder, C. C. (2018). Inflation expectations and the price at the pump. *Journal of Macroeconomics, 58*, 1–18.

Blanchard, O. J., & Galí, J. (2007). The macroeconomic effects of oil price shocks: Why are the 2000s so different from the 1970s? *National Bureau of Economic Research Working Paper,* Number 13368.

Bun, M., Koistinen, J., & Stokman, A. (2018). *Note on the estimation of substitution elasticities with three inputs.* Amsterdam: DNB.

Carvalho, V. M. (2014). From micro to macro via production networks. *Journal of Economic Perspectives, 28*(4), 23–48.

Carvalho, V. M., & Tahbaz-Salehi, A. (2019). Production networks: A primer. *Annual Review of Economics, 11*, 635–663.

Coibion, O., & Gorodnichenko, Y. (2015a). Information rigidity and the expectations formation process: A simple framework and new facts. *American Economic Review, 105*(8), 2644–2678.

Coibion, O., & Gorodnichenko, Y. (2015b). Is the Phillips curve alive and well after all? Inflation expectations and the missing disinflation. *American Economic Journal: Macroeconomics, 7*(1), 197–232.

Coibion, O., Gorodnichenko, Y., & Kamdar, R. (2018). The formation of expectations, inflation, and the Phillips curve. *Journal of Economic Literature, 56*(4), 1447–1491.

Coibion, O., Gorodnichenko, Y., Kumar, S., & Pedemonte, M. (2020). Inflation expectations as a policy tool? *Journal of International Economics, 124*, 103297.

Coibion, O., Gorodnichenko, Y., & Ropele, T. (2020). Inflation expectations and firm decisions: New causal evidence. The Quarterly Journal of Economics, 135(1), 165-219.

Colmer, J., Martin, R., Muûls, M., & Wagner, U. J. (2025). Does pricing carbon mitigate climate change? Firm-level evidence from the European Union emissions trading system. *Review of Economic Studies, 92*(3), 1625–1660.

De Fiore, F., Lombardi, M. J., & Mangiante, G. (2025). The asymmetric and heterogeneous pass-through of input prices to firms' expectations and decisions *Bank for International Settlements Working Paper*, Number 1305.

Demir, B., Javorcik, B., Michalski, T. K., & Ors, E. (2024). Financial constraints and propagation of shocks in production networks. *Review of Economics and Statistics*, 106(2), 437-454.

Ganapati, S., Shapiro, J. S., & Walker, R. (2020). Energy cost pass-through in US manufacturing: Estimates and implications for carbon taxes. *American Economic Journal: Applied Economics, 12*(2), 303–342.

Gödl-Hanisch, I., & Menkhoff, M. (2023). Firms' Pass-through Dynamics: A Survey Approach. London: Centre for Economic Policy Research.

Gülşen, E., & Kara, H. (2021). Policy performance and the behavior of inflation expectations. *International Journal of Central Banking, 17*(4), 179–224.

Hamilton, J. D. (1983). Oil and the macroeconomy since World War II. *Journal of Political Economy, 91*(2), 228–248.

Hamilton, J. D. (2003). What is an oil shock? *Journal of Econometrics, 113*(2), 363–398.

Hooker, M. A. (2002). Are oil shocks inflationary? Asymmetric and nonlinear specifications versus changes in regime. *Journal of Money, Credit and Banking, 34*(2), 540–561.

Känzig, D. R. (2021). The macroeconomic effects of oil supply news: Evidence from OPEC announcements. *American Economic Review, 111*(4), 1092–1125.

Kilian, L. (2009). Not all oil price shocks are alike: Disentangling demand and supply shocks in the crude oil market. *American Economic Review, 99*(3), 1053–1069.

Kilian, L., & Zhou, X. (2022). Oil prices, gasoline prices, and inflation expectations. *Journal of Applied Econometrics, 37*(5), 867–881.

Koç, Ü., Öğünç, F., & Özmen, M. U. (2021). The role of expectations in the inflation process in Turkey: Have the dynamics changed recently? *Central Bank of the Republic of Türkiye Working Paper,* Number 21/02.

Lafrogne-Joussier, R., Martin, J. & Mejean, I. (2023), DP18596 Energy cost pass-through and the rise of inflation: Evidence from French manufacturing firms*. CEPR Discussion Paper,* Number 18596.

Mankiw, N. G., & Reis, R. (2002). Sticky information versus sticky prices: A proposal to replace the New Keynesian Phillips curve. *Quarterly Journal of Economics, 117*(4), 1295–1328.

Mello, M., & Ponce, J. (2025). From global energy price shocks to firms' inflation expectations. *Latin American Journal of Central Banking*, 6(4), 100168.

Oral, E., Saygılı, H., Saygılı, M., & Tuncel, S. Ö. (2011). Inflation expectations in Turkey: Evidence from panel data. *OECD Journal: Journal of Business Cycle Measurement and Analysis,* 1, 5–28.

Özmen, İ., & Özşahin, Ş. (2023). Effects of global energy and price fluctuations on Turkey's inflation: New evidence. *Economic Change and Restructuring, 56*(4), 2695–2728.

Patzelt, P., & Reis, R. (2024). Estimating the rise in expected inflation from higher energy prices. Patzelt, P. and R. Reis (2024). Estimating the rise in expected inflation from higher energy prices. *CEPR Discussion Paper,* Number 18907.

Rotemberg, J. J., & Woodford, M. (1996). Imperfect competition and the effects of energy price increases on economic activity. *Journal of Money, Credit and Banking, 28*(4), 550–577.

Soybilgen, B., & Yazgan, E. (2017). An evaluation of inflation expectations in Turkey. *Central Bank Review, 17*(1), 31–38.

Weber, M., D'Acunto, F., Gorodnichenko, Y., & Coibion, O. (2022). The subjective inflation expectations of households and firms: Measurement, determinants, and implications. *Journal of Economic Perspectives, 36*(3), 157–184.

Wehrhöfer, N. (2023). Energy prices and inflation expectations: Evidence from households and firms, *Deutsche Bundesbank Discussion Paper,* Number 28/2023.

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*(8), 1673–1689.

Table 1: Baseline Estimations

	(1) CPI Expectations	(2) PPI Expectations	(3) Unit Price Expectations	(4) Unit Cost Expectations
Brent Oil Price x Energy Exposure	0.205***	0.265***	0.0025**	0.0039***
	(0.066)	(0.091)	(0.0010)	(0.0011)
Brent Oil Price	10.644***	14.578***	0.0573***	0.0432***
	(0.311)	(0.417)	(0.0055)	(0.0065)
Energy Exposure	-0.394	-0.555	-0.0086**	-0.0161***
	(0.262)	(0.363)	(0.0043)	(0.0047)
Obs.	226,152	229,222	262,442	262,442
Firm FE	✓	✓	✓	✓
Sector x Month FE	✓	✓	✓	✓
Adj. R^2	0.299	0.284	0.254	0.275

Notes: This table presents the main results based on Equation (1). The estimations are based on an unbalanced monthly panel of 3,724 Turkish manufacturing firms for the period January 2009-December 2023. In column (1), the dependent variable ($CPI\ Expectations$) is 12 months ahead expectations for annual consumer price inflation rate (in percentages) of surveyed firms, whereas, in column (2), the dependent variable ($PPI\ Expectations$) is 12 months ahead expectations for annual producer price inflation rate (in percentages) of surveyed firms. In column (3), the outcome series ($Unit\ Price\ Expectations$) is a binary variable taking the value of one if surveyed firms expect an increase in unit prices for the next three months, otherwise zero. In column (4), the outcome series ($Unit\ Cost\ Expectations$) is a binary variable taking the value of one if surveyed firms expect an increase in unit costs for the next three months, otherwise zero. The data on all outcome variables are obtained from microdata on responses from CBRT Business Tendency Survey. In terms of independent variables, $Brent\ Oil\ Price$ is the log-transformed global Brent oil price index. The variable $Energy\ Exposure$ is the ratio of sum of electrical, natural gas-based and petrol-related purchases (made by a specific firm in a given timepoint) to total input purchases, which is calculated from microdata on firm-to-firm trade taken from CBRT sources. All columns include firm and sector-by-month fixed effects. Standard errors clustered at firm level are reported. ***, **, * represent statistical significance at 1%, 5%, 10%, respectively.

Table 2: Alternative Proxies for Energy Prices

	(1) CPI Expectations	(2) PPI Expectations	(3) Unit Price Expectations	(4) Unit Cost Expectations
Natural Gas Price x Energy Exposure	0.083* (0.048)	0.096 (0.066)	0.0011* (0.0006)	0.0018** (0.0007)
Natural Gas Price	16.159*** (0.225)	22.276*** (0.349)	0.0992*** (0.0038)	0.0901*** (0.0037)
Energy Exposure	0.117 (0.145)	0.132 (0.202)	-0.0019 (0.0022)	-0.0053** (0.0023)
Obs.	226,152	229,222	262,442	262,442
Firm FE	✓	✓	✓	✓
Sector x Month FE	✓	✓	✓	✓
Adj. R^2	0.512	0.524	0.271	0.286

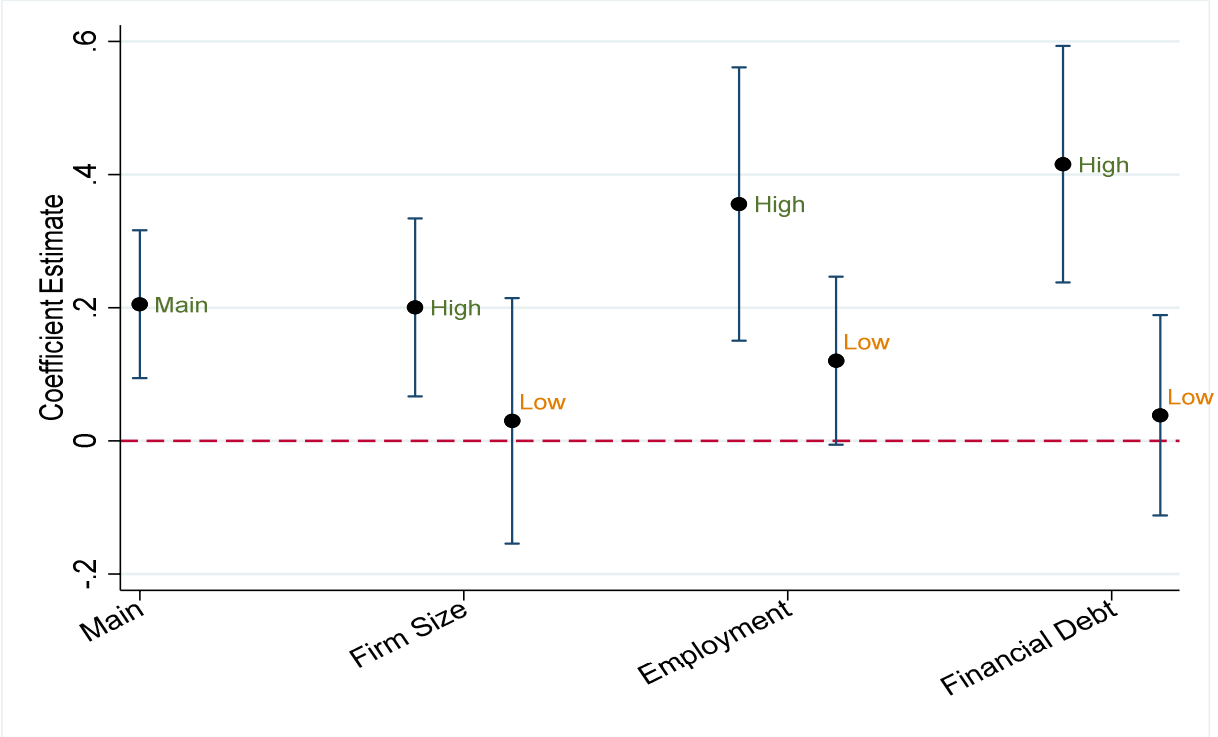
Notes: This table presents the robustness checks of the main results by using an alternative proxy for global energy prices. The estimations are based on an unbalanced monthly panel of 3,724 Turkish manufacturing firms for the period January 2009-December 2023. In column (1), the dependent variable ($CPI\ Expectations$) is 12 months ahead expectations for annual consumer price inflation rate (in percentages) of surveyed firms, whereas, in column (2), the dependent variable ($PPI\ Expectations$) is 12 months ahead expectations for annual producer price inflation rate (in percentages) of surveyed firms. In column (3), the outcome series ($Unit\ Price\ Expectations$) is a binary variable taking the value of one if surveyed firms expect an increase in unit prices for the next three months, otherwise zero. In column (4), the outcome series ($Unit\ Cost\ Expectations$) is a binary variable taking the value of one if surveyed firms expect an increase in unit costs for the next three months, otherwise zero. The data on all outcome variables are obtained from microdata on responses from CBRT Business Tendency Survey. In terms of independent variables, $Natural\ Gas\ Price$ is the log-transformed global natural gas price index. The variable $Energy\ Exposure$ is the ratio of sum of electrical, natural gas-based and petrol-related purchases (made by a specific firm in a given timepoint) to total input purchases, which is calculated from microdata on firm-to-firm trade taken from CBRT sources. All columns include firm and sector-by-month fixed effects. Standard errors clustered at firm level are reported. ***, **, * represent statistical significance at 1%, 5%, 10%, respectively.

Table 3: Controlling for Other Commodity Price Movements

	(1) CPI Expectations	(2) PPI Expectations	(3) Unit Price Expectations	(4) Unit Cost Expectations
Brent Oil Price x Energy Exposure	0.269***	0.353***	0.0029***	0.0043***
	(0.069)	(0.094)	(0.0010)	(0.0011)
Brent Oil Price	10.241***	14.207***	0.0618***	0.0477***
	(0.305)	(0.411)	(0.0056)	(0.0065)
Energy Exposure	-0.663**	-0.914**	-0.0097**	-0.0171***
	(0.275)	(0.378)	(0.0043)	(0.0047)
Obs.	226,152	229,222	262,442	262,442
Other Controls	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Sector x Month FE	✓	✓	✓	✓
Adj. R^2	0.327	0.310	0.257	0.277

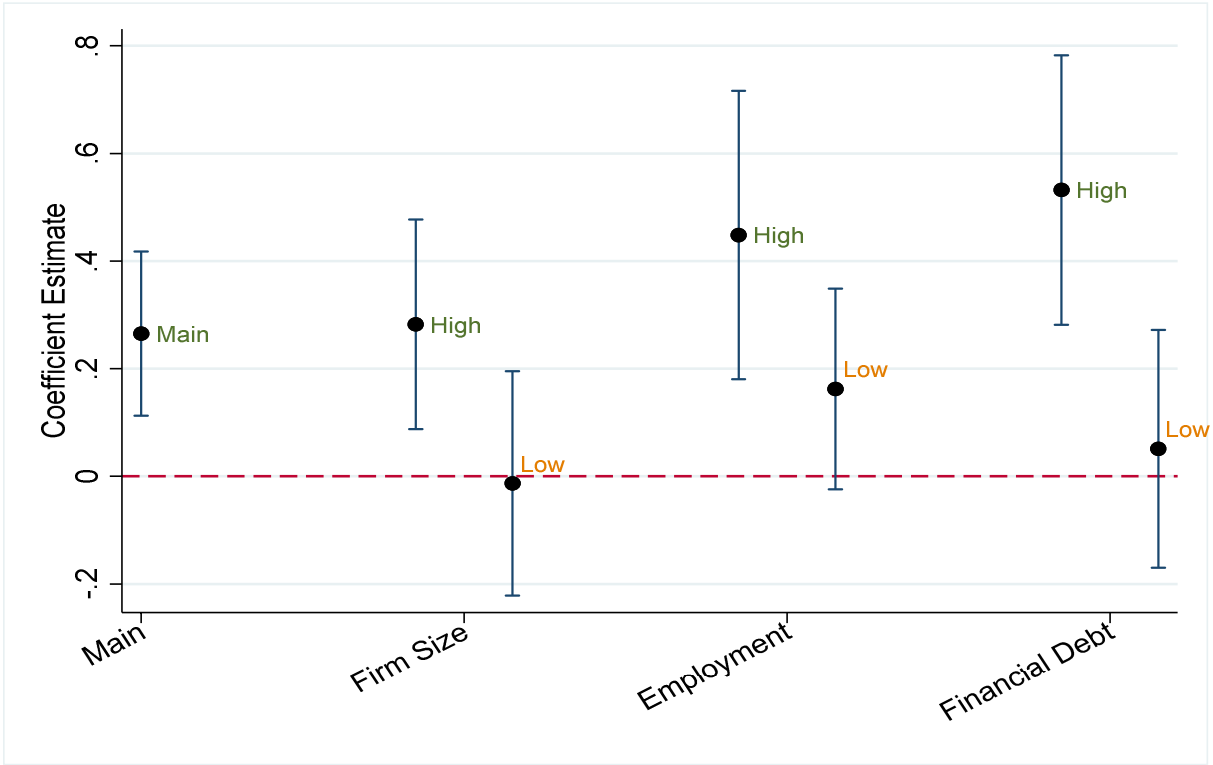
Notes: This table presents the robustness checks of the main results by using additional controls for global agriculture and non-industry metal prices. The estimations are based on an unbalanced monthly panel of 3,724 Turkish manufacturing firms for the period January 2009-December 2023. In column (1), the dependent variable ($CPI\ Expectations$) is 12 months ahead expectations for annual consumer price inflation rate (in percentages) of surveyed firms, whereas, in column (2), the dependent variable ($PPI\ Expectations$) is 12 months ahead expectations for annual producer price inflation rate (in percentages) of surveyed firms. In column (3), the outcome series ($Unit\ Price\ Expectations$) is a binary variable taking the value of one if surveyed firms expect an increase in unit prices for the next three months, otherwise zero. In column (4), the outcome series ($Unit\ Cost\ Expectations$) is a binary variable taking the value of one if surveyed firms expect an increase in unit costs for the next three months, otherwise zero. The data on all outcome variables are obtained from microdata on responses from CBRT Business Tendency Survey. In terms of independent variables, $Brent\ Oil\ Price$ is the log-transformed global Brent oil price index. The variable $Energy\ Exposure$ is the ratio of sum of electrical, natural gas-based and petrol-related purchases (made by a specific firm in a given timepoint) to total input purchases, which is calculated from microdata on firm-to-firm trade taken from CBRT sources. All columns include additional control variables monitoring other global commodity prices. Specifically, we incorporate an indicator for global agricultural commodity prices, which is taken as the residuals of an auxiliary time series model regressing agricultural commodity price index on Brent oil prices, global non-industry metal price index and time trend. Similarly, we also incorporate and indicator for global non-industry commodity prices, which is taken as the residuals of an auxiliary time series model regressing non-industry metal commodity price index on Brent oil prices, agricultural commodity price index and time trend. All columns include firm and sector-by-month fixed effects. Standard errors clustered at firm level are reported. ***, **, * represent statistical significance at 1%, 5%, 10%, respectively.

Figure 1: Sub-Sample Analysis Effect on CPI Expectations (Brent Oil Price x Energy Exposure)



Notes: This figure demonstrates the results of heterogeneity analysis for the estimations given in column (1) of Table 1. The model specification given in Equation (1) is repeated for sub-sample groups with higher and lower than median values of firm characteristics. The heterogeneity analysis is conducted with respect to $Firm\ Size$ (a binary variable taking the value of one for large firms based on regulatory classification, otherwise zero), $Employment$ (the number of employees) and $Financial\ Debt$ (the ratio of financial liabilities to total assets).

Figure 2: Sub-Sample Analysis Effect on PPI Expectations (Brent Oil Price x Energy Exposure)



Notes: This figure demonstrates the results of heterogeneity analysis for the estimations given in column (2) of Table 1. The model specification given in Equation (1) is repeated for sub-sample groups with higher and lower than median values of firm characteristics. The heterogeneity analysis is conducted with respect to $Firm\ Size$ (a binary variable taking the value of one for large firms based on regulatory classification, otherwise zero), $Employment$ (the number of employees) and $Financial\ Debt$ (the ratio of financial liabilities to total assets).

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