Idiosyncratic Bank Shocks and Firms' Expectations*

Yusuf Emre Akgündüz† *CBRT*
Emrehan Aktuğ‡ *Sabancı University*
Halil İbrahim Aydın§ *CBRT*
Yavuz Selim Hacıhasanoğlu¶ *CBRT*

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Abstract

We investigate the impact of idiosyncratic bank shocks on the firms' macroeconomic expectations by using a unique firm-bank dataset. Specifically, we match the Business Tendency Statistics (BTS) survey data with the loan data in Turkey, and identify bank credit supply shocks at the firm level. Our findings suggest that credit supply shocks significantly increase inflation expectations and expected investment for highly leveraged firms. This provides a novel channel through which firms' expectations are formed and has important implications for policymakers seeking to understand the transmission mechanisms of monetary and macroprudential policy.

Keywords: Inflation Expectations, Bank-Supply Shock, Expectation Formation
JEL Classification: E12; E24; E31; E52

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†Address: Address: Central Bank of the Republic of Türkiye, Istanbul/Turkey.
E-Mail: yusuf.akgunduz@tcmb.gov.tr
‡Address: Sabancı University, Department of Economics, Üniversite Caddesi, 34956, Istanbul/Turkey.
E-Mail: emrehan.aktug@sabanciuniv.edu
§Address: Address: Central Bank of the Republic of Türkiye, Istanbul/Turkey.
E-Mail: Halil.Aydin@tcmb.gov.tr
¶Address: Address: Central Bank of the Republic of Türkiye, Istanbul/Turkey.
E-Mail: Yavuz.Selim@tcmb.gov.tr

1 Introduction

Macroeconomic expectations, primarily inflation expectations, play a crucial role in economic decision-making, influencing households' consumption, saving decisions, wage contract negotiations, and firms' investment and pricing decisions. Consequently, they also affect the effectiveness of monetary and fiscal policy. An increasing amount of research underscores the significance of comprehending the factors influencing macroeconomic expectations, along with the mechanisms by which these expectations can impact the behavior of firms and other economic agents.

One branch of the literature focuses on how expectations are formed and why they are heterogeneous across agents (Weber et al., 2022a; D'Acunto et al., 2021b; Coibion et al., 2022). In addition to exploring the drivers of these expectations, recent work also examines how households' expectations impact their economic behavior and decisions (Roth and Wohlfart, 2020; D'Acunto et al., 2021b; Coibion et al., 2021; Vellekoop and Wiederholt, 2019). Since there are detailed surveys of consumers' expectations, some of which are even conducted for few decades, research on the household side is expanding rapidly. However, until recently, the lack of comparable firm-level surveys has left much work to be done on the firm side.[1]

The relationship between inflation expectations and firms' decisions is complex and multifaceted. Firms may adjust their investment and pricing decisions in response to changes in inflation expectations (Coibion et al., 2019, 2018) or in response to changes in expectation about future production (Enders et al., 2022). On the other hand, inflation expectations can be influenced by various factors, including changes in monetary and fiscal policy, shifts in consumer preferences, or changes in aggregate uncertainty (Kumar et al., 2022). Consequently, understanding the interplay between inflation expectations and firm behavior remains a crucial area of research.

We employ bank-firm-loan micro level data to examine the impact of idiosyncratic bank supply shocks on the formation of macroeconomic expectations. We find that bank supply shocks significantly influence the firms' expectations about aggregate inflation. This is actually analogous to

[1] Particularly, comparable quantitative surveys of firms' beliefs are inexplicably lacking (Coibion et al., 2018).

fact that the inflation consumers have observed in their own grocery bundles is indeed correlated with their inflation expectations (D'Acunto et al., 2021b). Their own shopping experience impact their expectations about aggregate inflation. Overall, individual experience matter in the expectation formation process of households (Weber et al., 2022a; D'Acunto et al., 2021c, 2022; Cavallo et al., 2017; Malmendier and Nagel, 2015; Madeira and Zafar, 2015; Kuchler and Zafar, 2019). Just as individual shopping experiences shape household expectations, in our context, firms' borrowing experiences influence their expectations of aggregate inflation. This is also closely related to the work of Andrade et al. (2022), who find that in response to industry-level inflation shocks that have no aggregate effects, firms' aggregate expectations respond significantly. In our setting, idiosyncratic bank-supply shocks that have no aggregate impact significantly notably alter firms' expectations of aggregate inflation. They attribute idiosyncratic firm-level variation they observe to aggregate forces. This observation aligns with the concept articulated by Lucas (1972), suggesting that firms possess better market-specific information than the economy as a whole and thus assign aggregate significance to local signals. In our case, firms may learn from their own experience but extrapolate aggregate implications from their idiosyncratic experiences.

Lastly, the paper sheds light on the link between unconventional policies and firms' inflation expectations.[2] As documented by D'Acunto et al. (2021a), unconventional fiscal policies notably boost households' expectations and spending.[3] Unconventional monetary policy tools such as the direct central bank intermediation of private lending and quantitative easing (Gertler and Karadi, 2011; Joyce et al., 2012) during downturns could also bolster firms' inflation expectations.[4] In particular, our findings suggest that credit guarantee schemes, which consist of government-guaranteed loans provided to firms and are implemented in over 70 economies including Turkey

[2]Mario Draghi, 2015: "When inflation expectations go up with zero nominal rates, real rates go down. When real rates go down, investments and the economic activity improves. That's the reasoning [of QE]."

[3]Coibion et al. (2023) demonstrate that forward guidance not only alters the perceived trajectory of nominal rates but also impacts inflation expectations.

[4]Additionally, another unconventional policy may involve government-guaranteed bank loans provided to firms through commercial banks (Pozo and Rojas, 2020). Examples include the Credit Guarantee Fund (KGF) in Turkey, the Central Guarantee Fund (FCG) in Italy, and similar mechanisms in countries like Korea, Chile, Mexico, Canada, and Slovenia.

(Gozzi and Schmukler, 2016), represent another significant policy tool for elevating firms' inflation expectations.[5] We demonstrate that idiosyncratic private-lending shocks significantly increase firms' inflation expectations. Thus, this novel transmission channel of unconventional credit policy could be vital for rejuvenating firms' inflation expectations during downturns.[6] Ultimately, our results offer empirical insights for models of expectations formation with heterogeneous firms.

The paper contributes to the literature in three primary ways. Firstly, we identify a novel determinant influencing firms' inflation expectations: idiosyncratic bank-supply shocks. Secondly, our findings highlight a new transmission channel of unconventional credit policies. Thirdly, we demonstrate how idiosyncratic credit supply shocks can change firms' investment expectations in addition to their current investment decisions, as suggested by Amiti and Weinstein (2018). Our study offers valuable insights across various literature strands.

The Business Tendency Statistics (BTS) is a monthly business survey conducted since 2002 by the Central Bank of Turkey on a representative sample of firms operating in industrial sectors. The Banking Regulation and Supervision Agency (BRSA) contains monthly detailed information on all loans granted by banks operating in Turkey, facilitating matching of the two datasets at the firm-bank level. Following Amiti and Weinstein (2018), we identify bank credit supply shocks at the firm level using this matched data. Then, we investigate how bank supply shocks impact the macroeconomic expectations of firms and find that credit supply shocks significantly increase inflation expectations and expected investment. This effect is particularly pronounced for firms with higher financial leverage. For highly leveraged firms, upon receiving a positive credit supply shock, the expected inflation in the next 12 months and expected investments in the next quarter

[5] Credit Guarantee Funds can offer external financing to targeted firms during economic downturns as a countercyclical measure.

[6] Inflation expectations are part of transmission mechanism of both QE and forward guidance (Boneva et al., 2016).

increase significantly, along with a notable rise in expected output.[7] Furthermore, we explore the significance of firms' exporter-importer status.

The main finding suggests that there is a direct causal evidence that idiosyncratic credit supply shocks significantly impact firms' inflation expectations and economic decisions.[8] This highlights an unexplored channel through which firms' expectations are formed and bears important implications for policymakers. Understanding the impact of credit supply shocks on firms' expectations and decisions is particularly important, as it can help shed light on the channels through which unconventional policies affect the economy. While previous studies have examined the impact of inflation expectations on firms' decisions, the role of credit supply shocks in shaping these expectations is a novel area of inquiry.

The paper is organized as follows: In Section 2, we provide a macroeconomic background to the question. Section 3 explains the framework of the research question by placing it into context. Section 4 presents details of the datasets used. Section 5 presents our empirical analysis. Finally, Section 6 concludes the paper.

2 Macroeconomic background

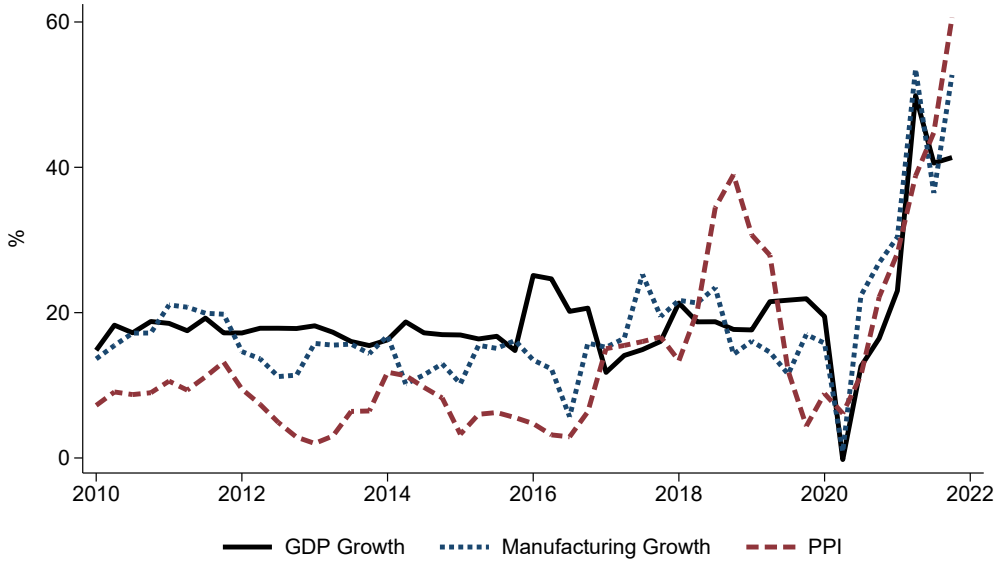
We investigate the relationship between credit supply shocks and inflation expectations from 2009 to 2021. Providing macroeconomic context about the Turkish economy during this period is essential to interpret the findings. Inflation expectations are sourced from a business survey targeting manufacturing, constituting approximately 15% of GDP in 2009. As depicted in Figure 1, manufacturing growth consistently lagged behind overall GDP growth until 2019. Following the sharp depreciation in 2018, exports, predominantly comprising manufacturing goods (95%), surged, leading to a growth in manufacturing outpacing overall GDP growth. By 2021, manufac-

[7] Firms with low financial leverage may be less susceptible to such shocks. Additionally, we also account for respondent characteristics in the expectation survey data. The position of the respondent, whether a manager or a mid-level executive, may play a crucial role because the reported forecasts might not be utilized in actual economic decisions made by the firm.

[8] Previous literature finds that inflation expectations impact firms' economic decisions (Coibion et al., 2018). Here, we propose that credit supply shocks may drive both to a certain extent.

turing value added had ascended to 22% of total GDP. While real GDP growth and manufacturing sector growth remained relatively stable post-Great Recession, there was a brief disruption at the onset of the Covid-19 pandemic, followed by a swift recovery with notable increases in both real growth and producer prices.

Figure 1: GDP and manufacturing growth and producer price inflation (Quarter-on-quarter)



Notes: CBRT Statistical Database.

A number of factor account for the trends in inflation and growth during the 2009 and 2021 period. Akcigit et al. (2020) who study business dynamism in Turkey between 2006 and 2016 find that economic dynamism was rising between 2006 and 2013, but slowed down after the Fed tapering in 2013 and the subsequent slowdown in foreign investment. Following the 2009 financial crisis which also affected the Turkish economy, GDP growth exceed 10% in 2010 and 2011. Economic growth slowed and unemployed rose after 2013 until 2017 when the government initiated a large credit expansion programme (Akçiğit et al., 2021; Aydin and Demiroglu, 2022). The rapid depreciation of the Turkish lira in 2018 led to another slowdown in the second half of 2018 and the first half of 2019 which had largely reversed by the beginning of 2020. While the pandemic had a significant negative impact on GDP in 2020, economic activity recovered relatively quickly with

annual growth reaching 11.4% in 2021.

Throughout the period inflation has been a persistent problem for the Turkish economy. While it fell in mid 2000s, it remained between 5 and 10% until 2018. Yearly inflation exceeded the 10% range after the rapid depreciation of the Turkish lira starting in the August of 2018. While there had been a significant fall in inflation by the end of 2019, the start of the pandemic in 2020 as well as the rise in the cost of energy imports led to a another rise in inflation which reached 36% by the end of 2021. A similar pattern is observed for producer price inflation in Figure 1 where the post-pandemic increase is even sharper and year on year inflation reaches over 75% by the end of 2021. We can then conclude that inflation expectations in Turkey are likely to vary significantly over the 2009 and 2021 period with a particularly large variation in in the post-pandemic period, during which inflation reached levels not seen since 2002.

3 Conceptual Framework

Island models, akin to the framework proposed by Lucas (1972), propose that firms face challenges in distinguishing between different shocks due to information constraints. In these models, there are multiple isolated "islands", and agents on each island can only trade with a subset of islands while lacking visibility of the entire economy. Consequently, they may conflate idiosyncratic, industry-specific, and aggregate shocks, unable to differentiate between shocks specific to themselves, their industry, and those affecting all firms. Expanding upon this notion, our paper posits that firms, due to imperfect monitoring and inattention, are unable to discern shocks specific to themselves from industry and aggregate shocks.

This implies that firms have incomplete visibility into both the broader economic conditions and their own industry's dynamics. Firms are unable to attend perfectly to all available information (Sims, 2003). Therefore, they may not only mistake industry-specific shocks with aggregate shocks but also confound idiosyncratic shocks that have no aggregate effect with other shocks.

In situations of uncertainty regarding the shock's nature, firms are inclined to assign weights to

idiosyncratic, industry, and aggregate shocks. Consequently, one would expect to observe a substantial impact of idiosyncratic shocks on firms' aggregate expectations due to this partial assignment. As a novel contribution to the literature, we find that firms attribute idiosyncratic variations that lack aggregate effects to aggregate forces. Upon receiving idiosyncratic credit supply shocks, they significantly adjust their aggregate inflation expectations. This adjustment occurs because firms interpret such shocks as indicative of loosened financial and credit conditions across the entire economy, leading to an anticipation of increased inflation. Under the assumption of full information, any idiosyncratic or industry-specific shock that lacks aggregate impact should not change agents' aggregate expectations. However, our evidence demonstrates that firms' aggregate expectations respond to idiosyncratic credit shocks that have no aggregate impact, thereby violating the full information hypothesis.

Assume the inflation expectation formation process of firm i is as follows:

$$\mathbb{E}_t^i \pi_{t+h} = g(Aggregate_t, Industry_t^i, Firm_t^i)$$

where $\mathbb{E}_t^i \pi_{t+h}$ denotes the expectation of firm i at time t regarding the inflation at time t+h and the expectation depends on aggregate factors, industry-specific factors and also firm-level factors. According to full-information rational expectation hypothesis, agents possess complete information about aggregate forces and should form their aggregate inflation expectations based on all aggregate information only. However, in island models, agents are not fully informed about aggregate factors, and firms rely partly on signals received about their own industries to shape their beliefs regarding aggregate and macroeconomic factors, as recently empirically documented by Andrade et al. (2022). By going one step further, we argue that idiosyncratic signals that firms receive such as credit supply shocks, obtained following Amiti and Weinstein (2018), play a significant role in shaping firms' aggregate expectations as firms attribute these idiosyncratic shocks to aggregate forces. Thus, firms, not being fully informed about both aggregate and industrial factors, partly rely on idiosyncratic signals to form their aggregate expectations. Firms' reliance on

idiosyncratic conditions to form aggregate beliefs can be one significant factor that explains the high level of disagreement among firms regarding aggregate factors.

4 Data

We use three main datasets for the analysis: the credit registry of all loans at the bank-firm-month level, firm financial statements collected annually by the Internal Revenue Administration and the Business Tendency Survey collected monthly by the Central Bank of the Republic of Turkey (CBRT). The credit registry allows us observe stock loans at the firm-bank level in Turkish liras and calculate credit supply shocks. We use the balance sheet data to construct several outcome variables such as the financial leverage of firms and retreive firm sector information. Finally, the Business Tendency Survey is our primary dataset that includes information about firm assesment of recent, current and future macroeconomic conditions and business performance.

The key to our analysis is that all three datasets can be merged at the firm level using CBRT's firm identifiers. Specifically, we use the period of data from 2009 to 2021 in the analysis.[9] The specific variables used in the analysis, their definitions and data sources are summarized by Table-1 and the relevant summary statistics are reported by Table-2.

[9] BTS and credit registry data go back to 2006 but the balance sheets do not.

Table 1: Variable definitions

Variable	Data source	Definitions
Credit supply shocks	Credit registry	Bank level credit supply shocks estimated using the Amiti and Weinstein (2014) approach from the population of all cash credits yearly December to December (TL and FX) and weighted at the firm level using previous years' bank level shares in firms' total credit. The variable is winsorized at 0.01 and 99.9 in the analysis.
Inflation	Business tendency survey	Expected PPI inflation in the next 12 months (log transformed in analysis)
Investment	Business tendency survey	Expected physical equipment investment for the next 12 months. Defined as a discrete variable between -1 and 1. -1 stands for expected decline, 0 for neutral and 1 for expected increase.
Output	Business tendency survey	Expected change in output during the next three months. Defined as a discrete variable between -1 and 1. -1 stands for expected decline, 0 for neutral and 1 for expected increase.
Price	Business tendency survey	Expected direction of own output price for the next three months. Defined as a discrete variable between -1 and 1. -1 stands for expected decline, 0 for neutral and 1 for expected increase.
Cost	Business tendency survey	Expected change in cost during the next three months. Defined as a discrete variable between -1 and 1. -1 stands for expected decline, 0 for neutral and 1 for expected increase.
Financial leverage	Balance sheets	Ratio of financial liabilities to assets as reported by the firm.
Investment	Balance sheets	Log change in investment as reported by the firm.

Table 2: Summary statistics

	Mean	p50	SD	p10	p90	N
Credit supply shock	0.0530	0.0386	0.1080	-0.0542	0.1720	63691
Expected inflation	12.7937	9.8950	9.2185	6	24.8550	55810
Financial leverage	0.2576	0.2240	0.2263	0	0.5789	20134
Investments (next 12 months)	1.0231	1	0.6071	0	2	57934
Output (next three months)	1.0973	1	0.6524	0	2	63352
Price (next three months)	1.1970	1	0.5376	1	2	61595
Costs (next three months)	1.4516	1	0.5732	1	2	61855
Investment (real)	0.1702	0.1559	0.3542	-0.0589	0.4434	19233

*** p<0.01, ** p<0.05, * p<0.1
Notes: The credit supply shock is the firm level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year. Financial leverage is the ratio of financial to total assets. Loan growth is the log change in loans between the December of each year and the sample includes all firms in the BTS matched with the credit registry data. All standard errors are heteroskedasticity robust and clustered at the firm level.

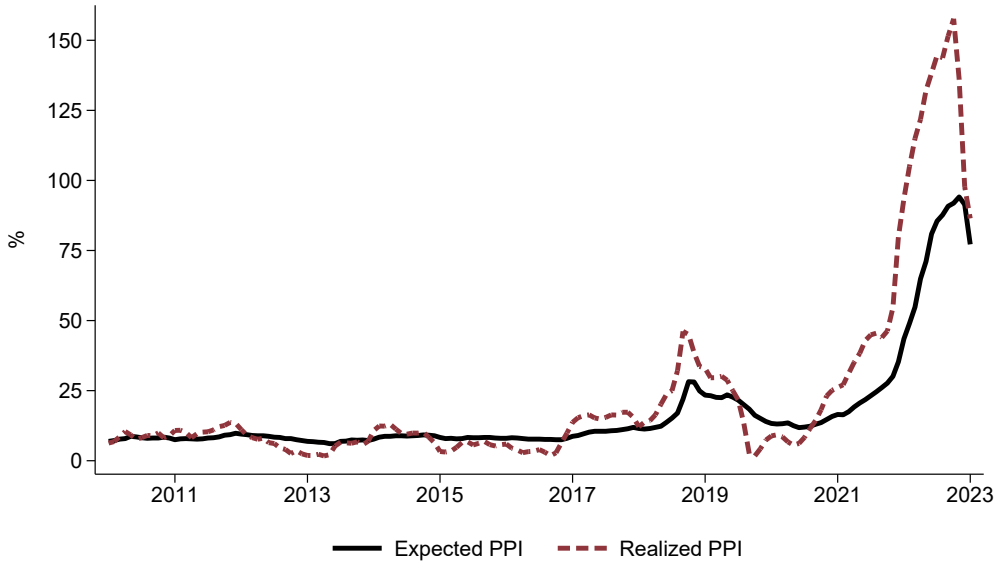
4.1 Business Tendency Survey

The BTS are collected to construct monthly confidence and expectation indeces for the manufacturing industry. On average, there are 1500 firms that respond in any given month and the survey has a semi-panel structure. Around 80% of firms are observed in all thirteen years between 2009 and 2021 and less than 4% are observed during only one or two years. This consistency is partially due to the average size of firms selected to be in the sample. Around 71% of responses are from firms denoted as large while only 2.5% are from small or micro sized firms.

The survey itself consists of 26 assessment questions of which we use the 5 that are most relevant to the present study. First is the expected producer price inflation (year-on-year) in 12 months. Firms are allowed to fill in any number for this question and the average response follows the producer price inflation closely as shown by Figure-2. Nevertheless, there is significant variation across firms and this variation peaks in 2018 when Turkey experienced a significant currency depreciation and during the Covid period starting in 2020. The remaining four variables from the BTS are assessments of investment expectations, output for the next three months and expected changes in the price of the firms' own output and costs in the next three months. The

responses for these questions are discrete and we construct discrete variables between -1 and 1 from responses that indicate whether the firm experienced or expects a neutral, upward or downward in the relevant dimension.

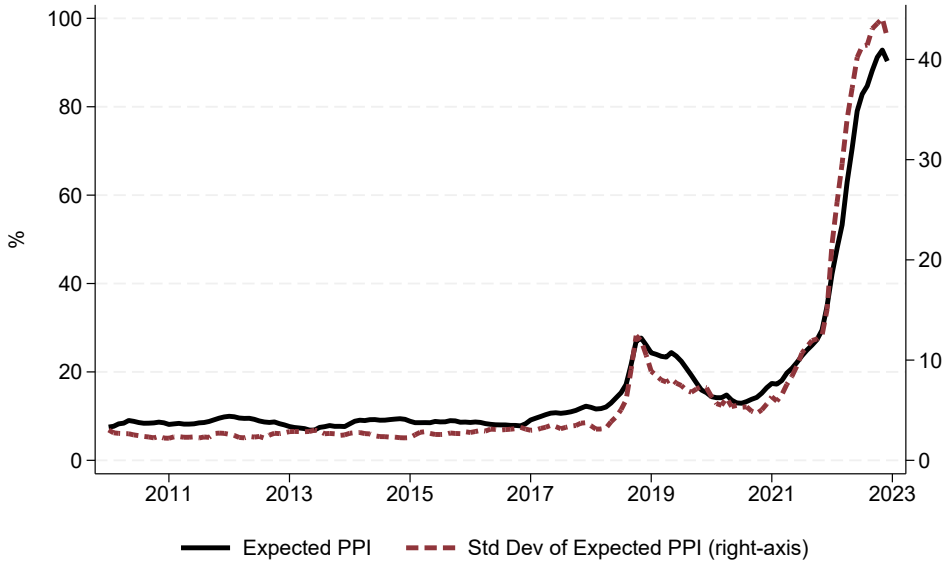
Figure 2: Expected and realized producer price inflation



Notes: CBRT Statistical Database and authors' calculations from the Business Tendency Survey.

Since we calculate bank credit supply shocks using annual loan growth according to firm-bank levels loans in December and financial statements are reported at the end of each year, we use responses from the fourth quarter of the BTS when constructing our sample. Using three months rather than just December expands the number of unique firms observed each year since firms can disappear for short periods from the BTS survey.

Figure 3: Expected inflation - level and standard deviation



Notes: Authors' calculations from the Business Tendency Survey.

Although inflation expectations remained relatively stable until 2018, heightened attention in response to the high inflationary environment led to a significant increase in average inflation expectations, which corresponded closely with realized inflation, albeit with notable disagreement among firms. As Figure-3 documents, disagreement among firms regarding PPI inflation sharply increased after the exchange rate shock of August 2018 (the first of many subsequent shocks). The level of expected inflation and the dispersion among firms are highly correlated, with a correlation exceeding 0.9, consistent with evidence in the literature.[10]

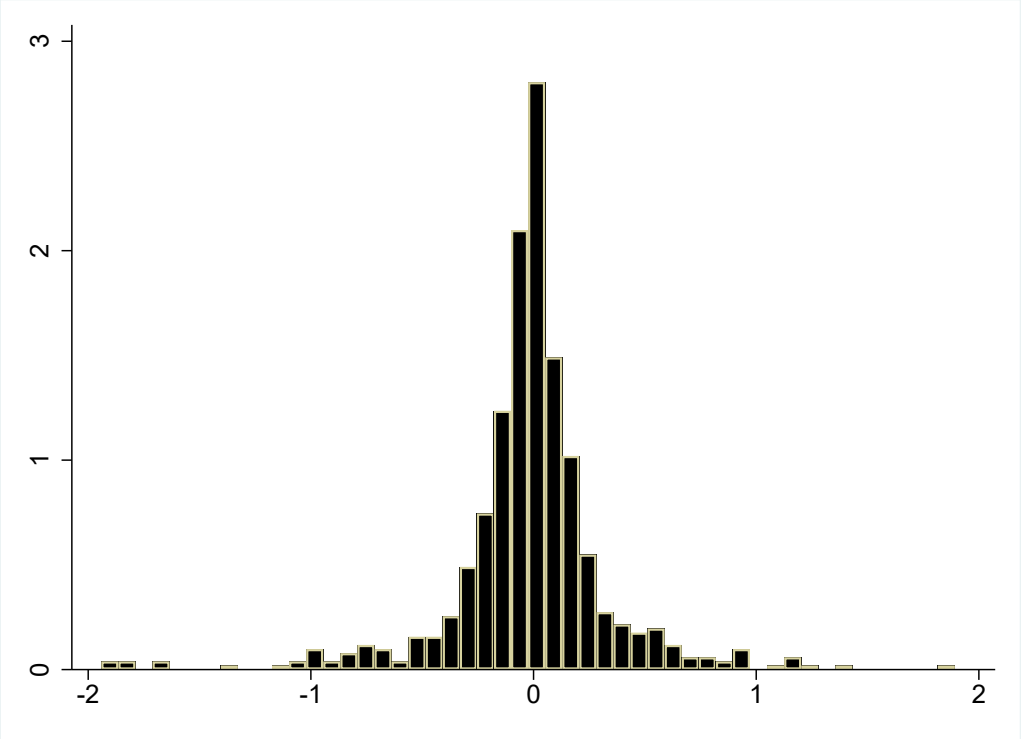
4.2 Credit registry

The Turkish firms receive financing almost entirely from banks and more than 95% of financial loans in 2021 were provided by banks. There are 3 state-owned and 26 privately-owned banks in the dataset. The credit registry further divides bank-firm level loans into subcategories by maturity. Short-term loans have a maturity less than a year, medium term loans between one and two

[10] See Mankiw et al. (2003); Candia et al. (2023); Weber et al. (2022b).

years and long-term loans longer than two years. Finally, loans are categorized as denominated in Turkish liras or foreign exchange. Observing FX loans is particularly relevant for the BTS sample since surveyed firms are relatively large and share of FX loans is around 42%. For both loan denominations, values are nevertheless provided in nominal Turkish liras.

Figure 4: Distribution of bank level credit supply shocks



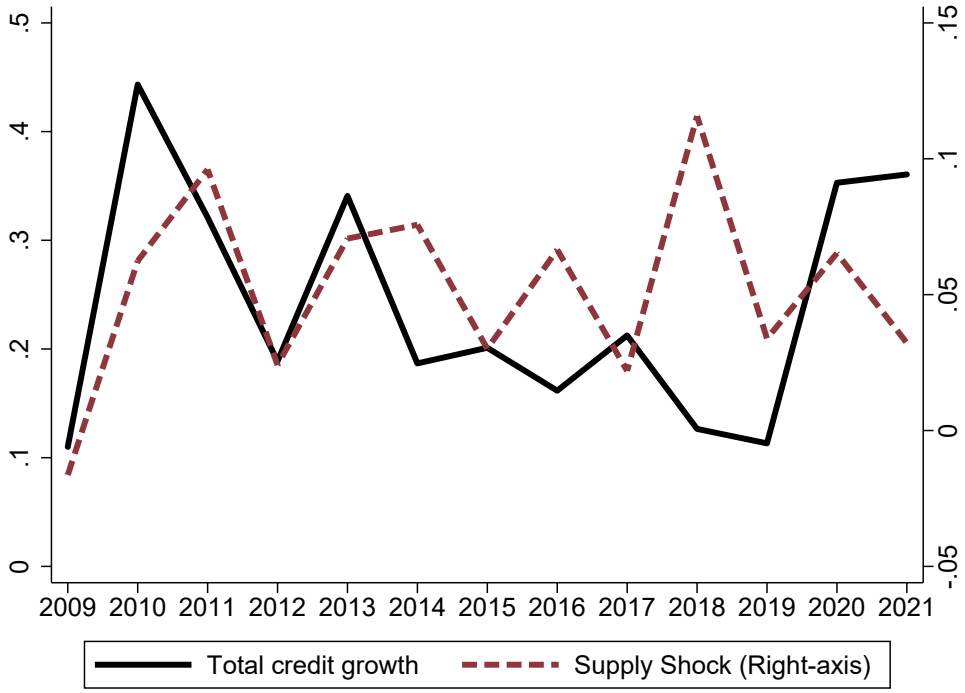
Notes: Authors' calculations from the credit registry. Excludes the top and bottom 1 percentile of shocks that correspond approximately to -2 and 2.

Figure-4 shows the distribution of firm-bank level credit supply shocks. The mean of these credit supply shocks is approximately zero with a standard deviation of 0.108. Over the period 2009-2021, the average expected inflation is 12.7 percent, which is higher than the official target of 5 percent but actually very close to the average realized inflation of 13.1 percent. Investments, output, price and costs are answers to survey questions about the change in them in the 3 months and, therefore, they are categorical variables. Table-1 lists all the variables and their sources, along with the definitions.

Bank level supply shocks are calculated using the population of firm-bank relationships in

each December. In order to calculate credit supply shocks at the firm level, the firm must have bank loans in two consecutive years. For any given year, the previous years' bank level loan shares are used to weight and derive firm level credit supply shocks from bank level supply shocks. These shocks can have significant variation as shown by Figure-4. While there is some concentration around 0, the average bank supply shock is positive which is unsurprising given the positive inflation level throughout the period. The annual average of credit supply shocks in the BTS sample is further correlated with the total credit growth as can be observed in Figure-5. We are able to calculate credit supply shocks for around 77% of the BTS sample.

Figure 5: Credit growth and BTS firms' credit supply shocks



Notes: CBRT Statistical Database and authors' calculations from the Credit Registry. The credit growth includes all credit including consumer loans and shows the growth for the fourth quarter of each year. Credit supply shocks are calculated using the change in loans in December compared to the previous December.

We check whether the bank-level credit supply shocks obtained from Amiti and Weinstein (2018) are correlated with the overall credit growth in the economy (Figure-5).[11] The main ad-

[11] Amiti and Weinstein (2018) document that idiosyncratic credit supply shocks can explain nearly 40 percent of aggregate loan fluctuations.

vantage of the methodology is that it allows for decomposition of aggregate lending into four channels: bank-supply shocks, firm-borrowing shocks, industry shocks and time-varying common factor. Using the methodology, one can analyze the impact of idiosyncratic credit supply shock on the firms' behavior. Particularly, when banks are large[12], these idiosyncratic shocks can explain a significant share of aggregate fluctuations. Although the correlation looks not perfect, the mean of credit supply shocks that we identify for the firms in our sample is moving not much different than the total credit growth in the economy.

4.3 Financial statements

Financial statements are obtained from supplements of income taxes submitted to the Internal Revenue Administration by firms above a certain turnover threshold which is adjusted annually according to inflation. Since firms selected to be in BTS are generally large, nearly all have a financial statement and only less than 1% of the BTS sample matched with the credit registry are lost due to missing financial statements.

Specifically, we use three variables from financial statements. First is financial leverage which is calculated as the ratio of financial debt to assets, second is investment which is defined as the change in annual log assets and the third is the 4-digit NACE sector code of the firm. It is worth noting that while the BTS is targeted towards manufacturing firms, around 3% of the firms are registered to be in a non-manufacturing sample.

[12] There are only 38 banks in Turkey so that idiosyncratic bank shocks are not negligible for aggregate fluctuations. The lending market is concentrated so that granular bank-level credit supply shocks constitute a significant part of aggregate fluctuations.

5 Empirical Analysis

5.1 First-Stage Results

At first, we analyze whether the credit supply shock is directly related to credit usage or not. Table-3 shows the first-stage estimation results. Normally, a sudden increase in credit supply that a firm faces does not necessarily lead to an increase in loans used. However, a one-standard deviation credit supply shock increases the financial leverage of firms by 0.38%, but the channel does not work through an increase in TL-denominated loans. Instead, the impact of a one-standard deviation shock on FX-denominated loans is significant and increases these loans by 2.8%. Additionally, in the case of a sudden increase in credit supply, firms have a tendency to decrease their long-term liabilities and increase short-term liabilities, yet this channel is only statistically significant for TL-denominated loans.[13] Overall, the idiosyncratic credit supply shocks obtained following Amiti and Weinstein (2018) have a significant impact on loans utilized.

Table 3: Effect on financial leverage and credit use

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		TL denom. loan growth			FX denom. loan growth		
	Financial leverage	Total	Short-term	Long-term	Total	Short-term	Long-term
Credit supply shock	0.0374***	-0.1767	0.7927*	-0.7291***	0.2796***	0.7224	-0.2157
	(0.0096)	(0.1495)	(0.4073)	(0.2110)	(0.0933)	(0.5541)	(0.4602)
Firm FE	+	+	+	+	+	+	+
Year FE	+	+	+	+	+	+	+
Sector x Year FE	+	+	+	+	+	+	+
N	63,196	21,682	21,682	21,682	14,492	14,492	14,492
R^2	0.505	0.505	0.505	0.505	0.505	0.505	0.505

*** p<0.01, ** p<0.05, * p<0.1
Notes: The credit supply shock is the firm level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year. Financial leverage is the ratio of financial to total assets. Loan growth is the log change in loans between the December of each year and the sample includes all firms in the BTS matched with the credit registry data. All standard errors are heteroskedasticity robust and clustered at the firm level.

[13] In other words, firms adjust their financing from long-term loans to short-term loans. Rising inflation expectation can be one reason behind this compositional change. See Ropele et al. (2022) for evidence from Italian firms.

In the next section, we document that the firm-level credit supply shock generates exogenous variation in inflation expectations of firms.

5.2 Main Empirical Results

Having established the relation between the credit supply shocks and actual usage of credits, we now turn to understanding the importance of these idiosyncratic shocks for shaping the expectations of firms regarding aggregate inflation and their real economic decisions. One may expect to see no impact of idiosyncratic credit supply shocks, which have no aggregate effects, on aggregate inflation expectations of firms. However, it seems like firms attribute idiosyncratic variation they observe to aggregate forces to some extent.

To assess the extent to which the credit supply shock affects firms' inflation expectations, we first run the following regression:

$$F_t^i \pi^{(12m)} = \alpha_i + \beta SupplyShock_t^i + \delta_t + \gamma_{st} + \varepsilon_t^i$$

where $F_t^i \pi^{(h)}$ is the 1-year ahead inflation (PPI) forecast of firm i at time t for horizon h. $SupplyShock_t^i$ stands for firm-level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year. α_i stands for firm fixed effects, which control for time-invariant firm-level differences and δ_t is time fixed effects, which control for any time-varying aggregate effects. Sector-time fixed effects, γ_{st}, control for observed and unobserved, time-varying sector-specific factors. Then, we extend the analysis to assess the impact of credit supply shocks on firms' expected sales, investment and pricing in the next 3 months. We observe a significant increase in aggregate inflation expectation of firms in response to idiosyncratic credit supply shocks, meaning that firms use their own firm-level exogenous shocks to make inferences about aggregate conditions. In other words, they attribute these idiosyncratic to aggregate forces. This result holds even after controlling for sectoral differences.

Table 4: Effect of credit supply shocks on expectations

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expectation:	Inflation	Investment	Output	Price	Inflation	Investment	Output	Price
Credit supply shock	0.0643***	0.0653*	0.0047	0.0434	0.0588**	0.0715*	0.0090	0.0462
	(0.0223)	(0.0369)	(0.0371)	(0.0291)	(0.0229)	(0.0375)	(0.0372)	(0.0293)
Firm FE	+	+	+	+	+	+	+	+
Year FE	+	+	+	+	+	+	+	+
Sector x Year FE					+	+	+	+
N	55,702	57,832	63,298	61,525	55,325	57,426	62,850	61,083
R^2	0.722	0.262	0.233	0.300	0.730	0.276	0.251	0.315

*** p<0.01, ** p<0.05, * p<0.1
Notes: The credit supply shock is the firm level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year. Inflation expectations are log transformed, the remaining expectation variables are discrete variables between -1, 0 and 1 where -1 is expected decline, 0 is neutral and 1 is expected increase. Panel A specifications include firm and year fixed effects. Panel B further includes 2 digit sector x year fixed effects. All standard errors are heteroskedasticity robust and clustered at the firm level.

Table-4 documents the main results of the paper. Idiosyncratic credit supply shock leads to an increase in aggregate inflation expectations of firms. To make the interpretation understandable, we are going to focus on the impact of a shock that raises financial leverage by 3.8 percent, which is documented in the previous table.[14] Theoretically, one's prior would be to see no impact of firm-level variation that is orthogonal to aggregate conditions on firms' aggregate expectations. The result suggests that an idiosyncratic credit supply shock leads to a 0.064% point increase in aggregate inflation expectations of firms, after controlling for sector and year fixed effects.[15] Firms' individual experience with credit supply increase their expectations regarding aggregate inflation. Since the specification includes time fixed effects and sector fixed effects, they would soak up all aggregate and sectoral variation. Innovations to firm-specific credit supply are orthogonal to aggregate and sectoral dynamics. Since firms adjust their aggregate expectations in response to these idiosyncratic shocks, this means firms are unable to separately identify innovations that are specific to themselves from those that are common to everyone or to the ones in their own sector.

[14] This corresponds to a 9 standard deviation shock. The advantage of using a credit supply shock is that we can measure its impact even if the firm is not using credit from banks.

[15] Figure-A1 shows the variation in aggregate expectations that the idiosyncratic credit shock can explain.

This can be considered as a significant firm-level evidence for the violation of the full-information rational expectations (FIRE) hypothesis. This previously unexplored channel can be considered as a novel driver of firms' aggregate inflation expectations. While forming expectations, firm not only attribute sectoral variation to aggregate forces as in (Andrade et al., 2022), but also idiosyncratic credit supply shocks that they receive.

When we only have time fixed effects, R-squared is 0.58 but instead if we have the interaction term between sector and time fixed effects R-squared increases to 0.59. Time fixed effects captures include macro trends or other time-varying factors that systematically impact the outcome variable across all sectors and sector fixed effects capture any industry specific regulation, advancement or dynamics that can influence expectations. The interaction helps us capture the differential impact of time within each sector and controls for any sector-specific time trend. This means that controlling for sector characteristics has no explanatory power for the variation in aggregate inflation expectations of firms, unlike Andrade et al. (2022). However, when we add firm fixed effects, the model can explain the %73 of the total variation in the inflation expectations. Therefore, we conclude that while firm-level idiosyncratic characteristics play a significant role in forming aggregate expectations, and there is quite limited room for sector-level time varying dynamics in the expectation formation process of firms about aggregate inflation.

Additionally, the shock also leads to a significant increase in firms' expected investment in the next 12 month. However, this is not the case for other firm-level expectationts. There is no significant impact of expected change in output or cost during the next three months on aggregate expectations. The credit supply shock does not change the expected prices in the next quarter as well.[16]

[16]Recently, Renkin and Zuullig (2024) utilize the 2007–2008 global financial crisis as a source of exogenous variation in the loan supply to document the impact of credit supply on firms' output prices.

Table 5: Effect of credit supply shocks on expectations

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expectation:	Inflation	Investment	Output	Price	Inflation	Investment	Output	Price
CSS (firm-level)	0.0647***	0.0508	0.0003	0.0593*	0.0609**	0.0520	-0.0032	0.0476
	(0.0234)	(0.0381)	(0.0385)	(0.0304)	(0.0237)	(0.0383)	(0.0382)	(0.0302)
CSS (sector-level)	0.0351	0.1276	-0.0395	-0.1423*	0.0071	0.2709**	0.1190	0.0333
	(0.0676)	(0.1071)	(0.1184)	(0.0832)	(0.0803)	(0.1308)	(0.1364)	(0.0982)
Firm FE	+	+	+	+	+	+	+	+
Year FE	+	+	+	+	+	+	+	+
Sector FE					+	+	+	+
N	54,088	56,124	61,454	59,731	53,976	56,013	61,330	59,610
R^2	0.763	0.530	0.464	0.543	0.768	0.538	0.482	0.549

*** p<0.01, ** p<0.05, * p<0.1

Notes: The credit supply shock is the firm level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year. Inflation expectations are log transformed, the remaining expectation variables are discrete variables between -1, 0 and 1 where -1 is expected decline, 0 is neutral and 1 is expected increase. Panel A specifications include firm and year fixed effects. Panel B further includes 2 digit sector x year fixed effects. All standard errors are heteroskedasticity robust and clustered at the firm level.

To examine the significance of sector-level credit supply shocks, we incorporate the sectoral shocks derived from the decomposition into the model. Consistent with the previous explanation, Table-5 shows that sector-level shocks do not significantly influence firms' inflation expectations. The crucial factor in expectation formation is the idiosyncratic shocks that firms experience, which they attribute to aggregate forces, thereby violating the FIRE assumption.

In the specification without sector fixed effects, sector-level credit supply shocks somewhat reduce firms' pricing expectations. This may be because sectors with greater access to credit can enhance optimal capital-labor allocation and reduce marginal costs, or due to increased competition resulting from easier access to credit, which can exert downward pressure on prices. However, when focusing on within-sector variation (Panel B), sectoral shocks have no significant impact on price expectations. Nonetheless, a positive sector-level credit supply shock increases a firm's investment expectations, likely as an attempt to keep up with other firms in the sector.

In short, although sector-level shocks may influence firms' idiosyncratic expectations, they

do not significantly impact aggregate inflation expectations. Firms do not attribute sector-level shocks to aggregate forces, unlike idiosyncratic shocks. This finding supports the claim that idiosyncratic shocks, rather than sectoral shocks, play a more critical role in the formation of aggregate inflation expectations.

Table 6: Effect estimated for the high financial leverage firms subsample

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(5	(6)	(7)	(8)
Expectation:	Inflation	Investment	Output	Price	Inflation	Investment	Output	Price
Credit supply shock	0.0790**	0.1079**	0.0878*	0.0094	0.0818**	0.1518***	0.1006*	0.0286
	(0.0322)	(0.0512)	(0.0519)	(0.0418)	(0.0337)	(0.0518)	(0.0524)	(0.0416)
Firm FE	+	+	+	+	+	+	+	+
Year FE	+	+	+	+	+	+	+	+
Sector x Year FE					+	+	+	+
N	30,839	32,196	35,026	34,089	30,464	31,796	34,583	33,650
R^2	0.725	0.261	0.230	0.287	0.736	0.280	0.253	0.306

*** p<0.01, ** p<0.05, * p<0.1
Notes: High financial leverage firms have an above median financial leverage of 0.25 or higher. The credit supply shock is the firm level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year.Inflation expectations are log transformed, the remaining expectation variables are discrete variables between -1, 0 and 1 where -1 is expected decline, 0 is neutral and 1 is expected increase. Panel A specifications include firm and year fixed effects. Panel B further includes 2 digit sector x year fixed effects. All standard errors are heteroskedasticity robust and clustered at the firm level.

We redo the same benchmark exercise for a subsample of highly leveraged firms, which have an above median financial leverage of 0.25 or higher (Table-6). The effect of credit supply shock should be keenly felt by firms that finance their assets through loans, so the impact on expectations are expected to be higher for those firms.[17] As expected, the impact of credit supply shock on inflation expectation is stronger for highly leveraged firms: the shock leads to a significant increase in aggregate inflation expectations of firms. While Andrade et al. (2022) document that an increase in firm's aggregate inflation expectation raises credit demand, our results suggests that credit supply shocks increase firm's aggregate inflation expectation and the channel is more pronounced if the firm is highly leveraged. The result is even stronger with sector-time fixed effects,

[17] Amiti and Weinstein (2018) document that firms that rely on loan financing are more susceptible to bank-supply shocks compared to firms with very low loan-to-asset ratios.

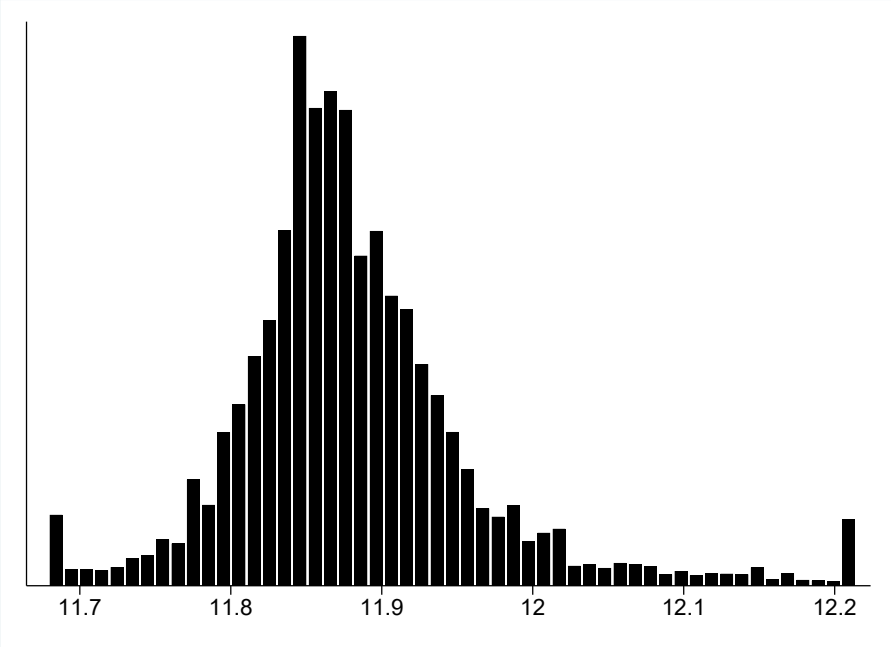
meaning that the significance does not derive from the sectoral differences at all. The impact is significant on investment and output expectations fo the firm as well.

——————— (We can run IV to see this impact if 1st stage is not weak, where instruments are both idiosyncratic and also industry shocks) After documenting the impact of credit supply shocks on firms' expectations, we now consider the effect of firms' inflation expectations on their economic plans such as pricing, investment and sales for the next 3 months. We rely on the following specification to assess this effect:

$$y_t^{i(3m)} = \alpha_i + F_t^i \pi^{(12m)} + \delta_t + \varepsilon_t^i$$

where y_t^i denotes planned action in the next 3 months for firm i at time t. We instrument for the inflation expectations at time t using the firm-level credit supply shock at time t. Firms' plans for next 3 months change contemporaneously in response to the shock at time t. We basically use the exogenous variation in inflation expectations stemmed from the firm-level credit supply shock to estimate the impact on firms' decisions for the next 3 months. The key identifying restriction here is that there are no channels through which the credit supply shocks affects economic decisions other than inflation expectations and the other expectations that are used as controls. ————————————————————————————-

Figure 6: Distribution of inflation expectations as a linear function of credit supply shocks (2009-2021)



Notes: Authors' calculations.

Figure-6 shows that the idiosyncratic credit supply shocks can explain a significant variation in inflation expectations of firms. Under full-information rational expectation model, idiosyncratic shocks are not expected to explain any variation in aggregate expectations. (I think we need to show the variation comes from the common shock, industry shock, credit supply shock and borrowing shock)

Moreover, idiosyncratic credit supply shocks lead to an increase in firms' investment plans. As documented in the literature, ex-ante plans and ex-post decisions are highly correlated, meaning that firms that claim they are going to increase investment more, ex-post end up having more investment (Bachmann and Elstner, 2015; Gennaioli et al., 2016; Kumar et al., 2022). To see that, we use firms' balance sheets and assess the impact of expected investment on the realized investment (Table-7). Firms expecting higher investments in the next quarter indeed ended up making more investments, consistent with other survey evidence.[18]

[18]Consistent with Amiti and Weinstein (2018), we can claim that there is a significant increase in investment of firms in response to credit supply shocks.

Table 7: Expectations and realized investment

	(1)	(2)	(3)	(4)	(5)	(6)
	Realized Investment					
Expected inflation	0.0163*		0.0144		0.0160	0.0139
	(0.0097)		(0.0100)		(0.099)	(0.0102)
Expected investment		0.0562***		0.0569***	0.0471***	0.0477***
		(0.0117)		(0.0113)	(0.0116)	(0.0112)
Firm FE	+	+	+	+	+	+
Year FE	+	+	+	+	+	+
Sector x Year FE			+	+	+	+
N	19,233	20,650	19,184	20,602	19,184	20,602
R^2	0.505	0.505	0.505	0.505	0.505	0.505

*** p<0.01, ** p<0.05, * p<0.1
*Notes:*Expected inflation and investment are the annual averages to the corresponding questions from the previous year. Investment is defined as the log change in total assets. All standard errors are heteroskedasticity robust and clustered at the firm level.

Regarding the relationship between inflation expectations and investment, the results suggest that inflation expectations are weakly associated with higher investment plans. The relationship becomes insignificant after controlling for sector level factors, which is actually consistent with recent survey evidence (Ropele et al., 2022).

5.3 Heterogeneity Analysis

In this section, we analyze heterogeneous responses of firms to the credit supply shocks. Table-8 shows that small firms increase their aggregate inflation expectations significantly at a larger amount compared to large firms. While the average impact of supply shock on aggregate inflation expectation is around 0.061 percentage point, the impact is close to 0.45 percentage point for small firms, nearly an order of magnitude higher. Small firms are more likely to attribute their idiosyncratic variation to aggregate forces. They respond strongly to their idiosyncratic experience and attribute a larger aggregate component to this shock so that they end up increasing their aggregate inflation expectations more compared to large firms.

Firms observe the credit supply shock and ask: is this happening because of an aggregate

Table 8: Heterogeneity by firm size

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expectation:	Inflation	Investment	Output	Price	Inflation	Investment	Output	Price
Credit supply shock	0.0613***	0.0688*	0.0035	0.0464	0.0561**	0.0742**	0.0075	0.0488*
	(0.0223)	(0.0371)	(0.0372)	(0.0292)	(0.0230)	(0.0377)	(0.0374)	(0.0294)
CSS x Small firm	0.3886**	-0.5012*	0.1380	-0.4020	0.3463*	-0.4099	0.1805	-0.3750
	(0.1868)	(0.3015)	(0.3785)	(0.2972)	(0.1817)	(0.2852)	(0.3698)	(0.3032)
Firm FE	+	+	+	+	+	+	+	+
Year FE	+	+	+	+	+	+	+	+
Sector x Year FE					+	+	+	+
N	55,702	57,832	63,298	61,525	55,325	57,426	62,850	61,083
R^2	0.505	0.505	0.505	0.505	0.505	0.505	0.505	0.505

*** p<0.01, ** p<0.05, * p<0.1

*Notes:*The credit supply shock is the firm level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year. Small firm is a dummy variable indicating whether the firm has fewer than 50 employees. Inflation expectations are log transformed, the remaining expectation variables are discrete variables between -1, 0 and 1 where -1 is expected decline, 0 is neutral and 1 is expected increase. Panel A specifications include firm and year fixed effects. Panel B further includes 2 digit sector x year fixed effects. All standard errors are heteroskedasticity robust and clustered at the firm level.

shock or because of something specific to me? Under such uncertainty firms probably put some weight on the possibility of an aggregate shock and some weight on idiosyncratic factors. Depending on the weight, they might be more likely to think about revising their aggregate expectations.

Although we observe a significant increase in inflation expectations, credit supply shock leads to a significant decrease in small firms' investment plans. This is probably due to fact that higher inflation expectations make small firms more pessimistic about the future economic outlook (Coibion et al., 2019). Since they have a more stagflationary view of the economy, they are less likely to invest and this creates a downward pressure on planned investments.

As another channel, the number of bank providing loans to the firm might be important in the sense that firms might be more attentive if they have more banking relationships and also might more accurately identify idiosyncratic shocks from banks. So, we analyze if firms that have relation with high number of firms are less likely to increase their aggregate inflation expectation in response to credit supply shock.

Table-9 documents that firms that borrow from more than 2 banks are not likely to increase their inflation expectations because they most likely realize that the credit supply shock they receive from a particular bank should be idiosyncratic[19] and cannot be attributed to the aggregate factors. As a result, there is no significant impact on the aggregate expectations of firms that have relation with multiple banks.

Table 9: Heterogeneity by the number of bank relationships

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expectation:	Inflation	Investment	Output	Price	Inflation	Investment	Output	Price
Credit supply shock	0.1171***	0.1359**	0.0486	0.0487	0.1134***	0.1136*	0.0321	0.0261
	(0.0373)	(0.0663)	(0.0658)	(0.0482)	(0.0380)	(0.0670)	(0.0660)	(0.0487)
CSS x No. of banks	-0.0468*	-0.0623	-0.0390	-0.0048	-0.0483*	-0.0370	-0.0205	0.0178
	(0.0278)	(0.0477)	(0.0473)	(0.0348)	(0.0283)	(0.0481)	(0.0472)	(0.0352)
Firm FE	+	+	+	+	+	+	+	+
Year FE	+	+	+	+	+	+	+	+
Sector x Year FE					+	+	+	+
N	55,325	57,426	62,850	61,083	55,325	57,426	62,850	61,083
R^2	0.505	0.505	0.505	0.505	0.505	0.505	0.505	0.505

*** p<0.01, ** p<0.05, * p<0.1

*Notes:*The credit supply shock is the firm level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year. The number of banks is the log of the number of banks that the firm has a relationship with. Inflation expectations are log transformed, the remaining expectation variables are discrete variables between -1, 0 and 1 where -1 is expected decline, 0 is neutral and 1 is expected increase. Panel A specifications include firm and year fixed effects. Panel B further includes 2 digit sector x year fixed effects. All standard errors are heteroskedasticity robust and clustered at the firm level.

Another channel might be related to the level of inflation and degree of inattention of firms. As the inflation increases, agents' have stronger prior beliefs about inflation. They place more weight on their prior knowledge and less weight on new information in case of high inflation, as documented by Cavallo et al. (2017). As inflation rises, people become more attentive and informed about the inflation, so they respond less to exogenous information shocks, as documented by Weber et al. (2023), using a wide range of survey datasets from various countries.[20] Moreover, when

[19]The credit supply shock is basically the weighted average of the shocks received from each bank.

[20]Changing uncertainty about inflation or changing trust in inflation statistics might be another source of having stronger prior beliefs about inflation. According to Weber et al. (2023), the reason for strong prior is that the agents have better knowledge of recent inflation in high inflationary environments as they are paying more attention.

idiosyncratic conditions are less variable and less important than aggregate conditions, firms pay less attention to idiosyncratic conditions than to aggregate conditions, as shown by (Mackowiak and Wiederholt, 2009). In Turkey, headline inflation had risen significant during the Covid period and even exceeded 80% in 2022. As a result, one would expect to see more attention to inflation and thus less reponse to exogenous shocks. To test this, we look at the Covid period only (Table-10), and we document that the impact of idiosyncratic supply shocks on aggregate inflation expectation is not significant anymore. The response of expected investment has become even stronger, because firms do not increase their inflation expectations anymore and they do not become more pessimistic about the economy (if they have a stagflationary view of the economy). As a result, in case of receiving a positive credit supply shock, they are more likely to invest in the near future compared to the pre-Covid period.

Table 10: Effects during the Covid period (2020-2022)

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expectation:	Inflation	Investment	Output	Price	Inflation	Investment	Output	Price
Credit supply shock	0.0093	0.2142***	0.0702	0.0611	-0.0075	0.2090**	0.0759	0.0760
	(0.0671)	(0.0808)	(0.0771)	(0.0654)	(0.0671)	(0.0819)	(0.0774)	(0.0662)
Firm FE	+	+	+	+	+	+	+	+
Year FE	+	+	+	+	+	+	+	+
Sector x Year FE					+	+	+	+
N	11,956	12,328	13,555	13,098	11,918	12,276	13,500	13,042
R^2	0.855	0.453	0.399	0.482	0.859	0.462	0.417	0.488

*** p<0.01, ** p<0.05, * p<0.1
*Notes:*The credit supply shock is the firm level weighted credit supply shocks of the banks that the firm had a relationship with in the previous year.Inflation expectations are log transformed, the remaining expectation variables are discrete variables between -1, 0 and 1 where -1 is expected decline, 0 is neutral and 1 is expected increase. Panel A specifications include firm and year fixed effects. Panel B further includes 2 digit sector x year fixed effects. All standard errors are heteroskedasticity robust and clustered at the firm level.

6 Conclusion

The drivers of inflation expectations are still not fully explored. This paper suggests a novel channel that idiosyncratic experience of firms might change their aggregate inflation expectations. This impact is quite significant and can account for 15% of deviation in the expectations after controlling for aggregate and sectoral factors. Revealing this new channel suggests that utilizing unconventional policies to boost supply of credits in the economy might create a distortion in aggregate expectations of firms as a side effect. Such a policy leads firm to increase their aggregate inflation expectations and this effect is more pronounced during times with relatively lower inflation.

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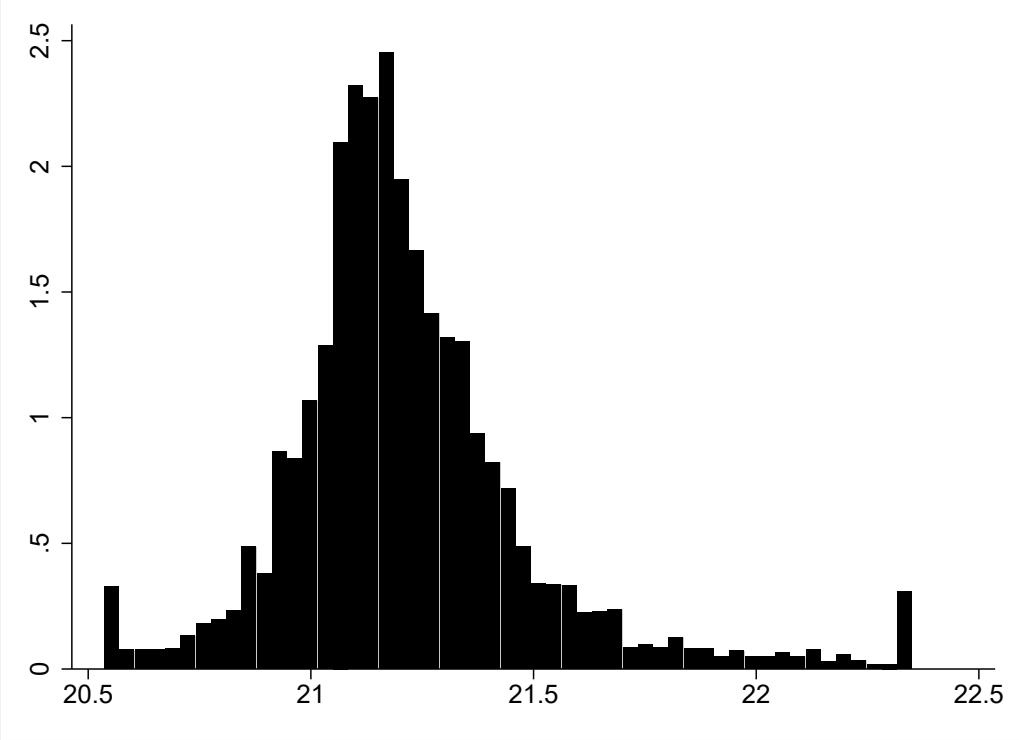
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Appendix - A - Additional Results

Figure A1: Distribution of inflation expectations as a linear function of credit supply shocks (2020-2021)



Notes: Authors' calculations.