Inflation Expectations
in the Wake of the War in Ukraine

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Abstract

Russia's invasion of Ukraine is posing a range of new challenges to the global economy, including affecting the inflation expectations of individuals. In this paper, we aim to quantify the effect of the invasion on short- and long-term inflation expectations of individuals in Germany. We use microdata from the Bundesbank Online Panel - Households (BOP-HH), for the period from February 15th to March 29th, 2022. Treating the unanticipated start of the war in Ukraine on the 24th of February 2022 as a natural experiment, we find that both short- and long-term inflation expectations increased as an immediate result of the invasion. Long-term inflation expectations increased by around 0.4 percentage points, while the impact on short-term inflation expectations was more than twice as large - around one percentage point. Looking into the possible mechanisms of this increase, we suggest that it can be partially attributed to individuals' fears of soaring energy prices and increasing pessimism about economic trends in general. Our results indicate that large economic shocks can have a substantial impact on both short and long-term inflation expectations.

Keywords: inflation expectations, Russian invasion of Ukraine, survey, natural experiment

JEL-Classification: D84, D12, E3

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1 Introduction

Russia's invasion of Ukraine is making the post-COVID recovery of the global economy more challenging. From its outset, the war has affected energy prices and inflation rates, which had already started to increase in mid-2021 in the later days of the COVID pandemic. Additional supply chain disruptions, price increases of goods imported from Ukraine and Russia, and climbing energy prices make inflation a very volatile aspect of the post-COVID period. If individuals anticipate high inflation and act accordingly by adjusting their consumption and/or demanding wage increases, and if companies simultaneously adjust their prices in anticipation of growing costs, rising inflation expectations can drive up real inflation. Studying changes in individuals' expectations can be useful for central banks and policymakers deciding future actions related to anchoring inflation and global economic recovery in general.

We use the start of the war in Ukraine as a natural experiment to document the impact of a large geopolitical shock on inflation expectations of individuals in Germany. The microdata for our study come from the Bundesbank Online Panel - Households (BOP-HH) – a monthly online survey that collects information on individuals' expectations regarding several economic indicators in Germany. The survey's field phase of February wave began on the 15th of February, several days before Russia invaded Ukraine, and continued until March 1st. The next wave of the survey included March 15th-29th. Because we have information on the exact date when respondents filled in the survey, we can determine causally and in real time how the onset of war in Ukraine affected individuals' short- and long-term inflation expectations. To determine causality, we perform an OLS regression with an indicator variable for the start of the war. The main identifying assumption in this setting is that the war was an unanticipated event that is exogenous to the time at which individuals chose to fill in the survey. Hence, there are no systematic differences in terms of individual characteristics between those respondents

that completed the survey before and after the invasion of Ukraine. The results from this analysis demonstrate an immediate upwards shift in both short- and long-term inflation expectations. We find that short-term inflation expectations (for the following 12 months) increase by around 1 percentage point as an immediate response to the invasion. For longer horizons (5 and 10 years), the increase in inflation expectations is smaller - around 0.4 percentage points.

We find that the results for short-term inflation expectations are robust to various approaches addressing the issue of outliers, and to different econometric strategies to tackle unobserved individual heterogeneity. Our results on long-term inflation expectations are unaffected in approximate size and direction by our robustness checks, but we lose significance for some specifications due to smaller sample sizes. To rule out any concerns regarding comparability of the control and treatment groups, we report the difference in means between the groups, rely on a difference-in-differences approach, perform a placebo regression with data from one year earlier, and most importantly - due to the panel component - add individual-level fixed effects to control for further unobserved heterogeneity in a fixed-effects regression.

We demonstrate that major preceding events, i.e., US President Biden's announcement on the probability of a war in Ukraine and Russian President Putin's assertion that Donetsk and Luhansk are independent republics had no effect on inflation expectations. Hence, the war was indeed unexpected by individuals and was an important factor in their inflation expectations.

To understand why individuals in Germany associate the start of the war in Ukraine with rising inflation, we look into two potential determinants discussed in the literature. First, one of the main implications of the war has been increasing energy prices. If individuals anticipated that the war would result fuel prices soaring further, they may have adjusted their expectations regarding inflation upwards (Istiak & Alam, 2019; Kilian & Zhou, 2022). Second, Binder (2020) and Kamdar (2018) find that households tend to associate bad economic outcomes with

both high unemployment (or low economic growth) and with high inflation. Our analysis demonstrates that these two aspects can contribute at last partially to the rising inflation expectations that we observe in the wake of the Russian invasion of Ukraine.

This paper contributes to several strands of literature. First, our findings are related to the large literature studying the expectation formation of market participants (D'Acunto et al., 2022; Weber et al., 2021; Coibion et al., 2018; Coibion & Gorodnichenko, 2015).[2] We contribute to this literature by exploring a large exogenous shock to individuals' inflation expectations - the start of the war. Our findings suggest that the war influenced individuals' expectations. We document that individuals saw the start of the war in Ukraine as a large shock to energy prices, which they expected would increase even further going forward. Our finding is consistent with the insights from Verbrugge & Higgins (2015), who document that unusual changes in energy-prices influence movements in individuals' inflation expectations.

We also contribute to recent emerging literature on the economic implications of the war in Ukraine (Bachmann et al., 2022; Ferrara et al., 2022; Pestova et al., 2022; Berninger et al., 2022). The paper by Dräger et al. (2022a) is closely related to our study. The authors find that the war shifted experts' inflation expectations considerably, with the main channel also being fear of further energy price hikes, which is consistent with our findings regarding individuals' expectations. On the firm side, Seiler (2022) finds that the war increased agents' long-term inflation expectations. We contribute to these studies by providing evidence on the inflation expectations of individuals in Germany.

In terms of empirical methodology, our study is related to the literature on event studies and natural experiments, which rely on unanticipated shock episodes for causal identification (see also DiNardo (2010), Fuchs-Schündeln & Hassan (2016), Cantoni & Yuchtman (2021) for a

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[2] D'Acunto et al. (2022) classify the main determinants of individual expectations regarding inflation into four main categories: i) prices they observe in daily life ii) lifetime experiences, iii) cognition, iv) news and information.

general literature review). We use the invasion of Ukraine on the 24th of February 2022, a large geopolitical event, which was unexpected to individuals living in Germany, as a natural experiment. We argue that the outbreak of the war was a relatively unanticipated event that was not correlated with individuals' characteristics and behaviour.

The rest of the paper is organised as follows. Section 2 describes the BOP-HH survey design and simple statistics on the data. In Section 3, we describe our identification strategy and report the main regression results. In Section 4, we examine the robustness of our main identifying assumption and examine whether the war was somehow anticipated by individuals. Section 5 describes the possible mechanisms of the rising inflation expectations, and Section 6 concludes.

2 Data and event description

The outbreak of the war in Ukraine in February 2022 took the world by surprise. Although many had previously discussed potential scenarios for such an event, few anticipated its occurrence, and certainly not the exact day of its onset. We use the timing as a natural experiment to identify whether this major unanticipated event played a decisive role in shaping individual sentiment.

2.1 The survey and timeline

To causally assess how Russia's invasion of Ukraine affected individuals' inflation expectations in Germany, we use microdata from the Bundesbank Online Panel - Households (BOP-HH). The BOP-HH is an online survey conducted on a monthly basis, which started collecting information on individuals' expectations regarding economic indicators in Germany prior to the onset of the COVID-19 pandemic. The survey includes individuals who are at least 16 years old and have used the internet at least once in the past months. It contains information on individuals' expectations regarding inflation, interest rates, and other macroeconomic variables,

individuals' socio-demographic characteristics, and the time of the interview, amongst other things (Beckmann & Schmidt, 2020). For most of our analyses, we use the BOP-HH waves from February and March 2022. For our robustness checks, we make use of previous waves of the survey.

In this paper, we primarily concentrate on survey's questions about short- and long-term inflation expectations.[3] For short-term expectations, the BOP-HH includes a quantitative question about how individuals expect the inflation rate to perform over the upcoming 12 months. To identify their expectations about longer-term inflation, the survey sample is randomly divided into two groups. Half of the sample is asked to state their point estimate of inflation over the next five years, and the other half states their expectations for ten years. The survey has had a rotating panel component since January 2021, and, in some waves, the latter questions on long-term inflation expectations are addressed only to "refreshers", i.e., respondents participating in the survey for the first time. Hence, we have a much smaller sample size for the longer-term expectations. We truncate the measures for expected inflation between the interval [-12%, 12%] both for long- and short-term expectations.[4]

Our sample includes data from around 7,000 respondents[5] surveyed in February and March 2022. The interviews were carried out from February 15th to March 1st, 2022 (the February wave), and from March 15th to March 29th, 2022 (the March wave). We use the information on the time individuals completed the survey to compare how short- and long-term inflation expectations differ between the group of individuals who responded to the questionnaire between the 15th and 23rd of February (*control group*) and those who responded after the invasion, in February and March 2022 (*treatment group*).

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[3] See the exact wording of the question in Appendix C.
[4] We truncate the data between the interval [-12%, 12%], following the design of probabilistic questions used in the New York Fed Survey of Consumer Expectations. The outer bins of this question end at -12 and +12 (Van der Klaauw et al., 2008). In Section 3, we report and discuss the results for alternative trimming procedures.
[5] In some cases, the total number of observations changes depending on the regression specification and inclusion of additional controls.

We reason that participants in the survey could not possibly have anticipated the invasion, or at least not the exact day it would begin. Nonetheless, there may have been some anticipation effects preceding the event, such as US President Biden's announcement of the possibility of a war in Ukraine and Russian President Putin's assertion that Donetsk and Luhansk are independent republics. Because our survey covers the time periods of both events preceding the invasion we can consider them in further analyses. In Figure 1, we display the timeline of these events and interview periods (waves) of the BOP-HH survey.

Figure 1. Timeline of events

Note: The figure displays the timeline of our survey, the invasion of Ukraine and preceding events. For the main part of our analyses, the *control group* is defined as respondents who filled in the questionnaire from February 15th to 23rd. *The treatment group* comprises the respondents who filled in the questionnaire from February 24th to March 1st and from March 15th to 29th. In the figure, we also indicate other major events that preceded the beginning of Russia's invasion of Ukraine.

For the descriptive section and the OLS analysis, we do not use the panel respondents, meaning that in case February respondents are also surveyed in March, we do not use their March responses. This leaves us with 4,442 observations in the control group, and 2,558 in the treatment group for short-term inflation expectations. Because the question on long-term inflation expectations is only addressed to refreshers in some waves, the number of observations is comparably small. For the long-term, we have around 930 observations in the control and around 1,226 in the treatment groups for 5 and 10-year inflation expectations together.

2.2 Descriptive results

Figure 2 depicts the distribution of inflation expectations among individuals surveyed before and after the invasion of Ukraine. In panel (a) we plot the distribution for their short-term inflation expectations (12 months ahead). The distribution for the individuals who completed the questionnaire on or after the 24th of February, the treatment group, is considerably further to the right than that of the control group. The average expectations regarding inflation for the next twelve months is 4.7% before the invasion. After the invasion, this average increases to 5.6% (see Appendix A, Table A1). This difference in means is about 0.9 percentage points. Aside from the increase in the mean, the median increased from 5% (control group) to 5.5% (treatment group).

Figure 2. The distribution of individuals' inflation expectations
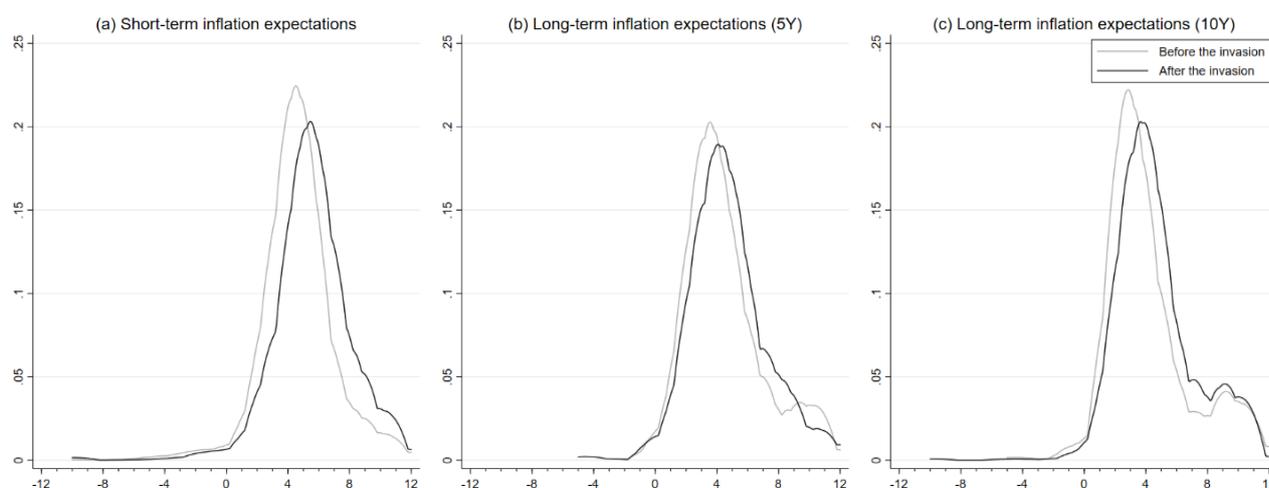
Note: The figure plots the distribution of inflation expectations for the next twelve months (panel (a)), five years (panel (b)) and ten years (panel (c)). The *control group* (before the invasion) is defined as respondents who filled in the questionnaire from February 15th to 23rd. The *treatment group* (after the invasion) are the respondents who filled in the questionnaire from February 24th to March 1st and from March 15th to 29th. Analytical weights are used[6]. Inflation expectations are measured as a point prediction and truncated between [-12%, 12%].

Long-term inflation expectations, for the upcoming five and ten years on average, were also affected by the start of the war in Ukraine, but to a lesser extent than the short-term. Panels (b) and (c) show that the distribution of long-term expectations also shifted to the right and that

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[6] The weights correct for the marginal distribution of age, gender, education, and region to be representative of the German (online) population aged 16 and older.

there is more mass at higher inflation rates. When asked about their expectations for the next five years, individuals who had not yet experienced the start of the war indicated an average (median) of 4.5% (4%). Those who responded after the war began, in contrast, reported an average (median) of 4.8% (5%). A similar structure is observed for the very long-term inflation expectations (panel (c)). Individuals in the control group had considerably lower expectations (mean: 4.2%) than the treatment group (mean: 4.6%). These differences between means are statistically significant at 1% (12 months and 5 years) and 5% (10 years) level (see Appendix A, Table A1).

3 Empirical framework

The descriptive results show a large shift in the expectations regarding inflation of individuals living in Germany, with the effect being particularly strong for short-run expectations. In this section, we extend our analysis beyond descriptive results. To examine the size and significance of the effect of the war in Ukraine on inflation expectations, we estimate the following regression model:

$$E_{it}\left(\pi_{t+1,t+5,t+10}\right) = \alpha + \beta Treatment_t + \gamma X_{it} + \varepsilon_{it} \qquad (1)$$

where $E_{it}(\pi_{t+1,t+5,t+10})$ is the inflation expectation of an individual i who responded to the survey in time period t – *before* or *after* the invasion. $Treatment$ is a dummy variable, that is equal to one from February 24th onwards and zero before. X_{it} are individual level characteristics, including age, employment status, gender, education, income, region of residence, and household and city size. The regression results rely on the identifying assumptions that the war was unexpected by the agents, and that the group who responded before the invasion is similar to the group that responded after. In Section 4, we perform further analyses to test whether our identifying assumptions hold.

Table 1. Before and after regression results

	(1)	(2)	(3)
	Exp. Infl. 12M	Exp. Infl. 5Y	Exp. Infl. 10Y
	Panel A		
Before vs after invasion	1.055***	0.423***	0.393**
	(0.05)	(0.14)	(0.15)
Control mean	4.67	4.50	4.18
Individual and household level controls	No	No	No
R^2	0.0537	0.008	0.0063
N	7000	1112	1044
	Panel B		
Before vs after invasion	1.074***	0.418***	0.389**
	(0.06)	(0.14)	(0.16)
Control mean	4.66	4.59	4.20
Individual and household level controls	Yes	Yes	Yes
R^2	0.0655	0.0620	0.0571
N	6696	1059	1002

Note: In panel A, we report the results from an OLS regression with a time dummy indicating the start of the war in Ukraine. We include only observations from February and March 2022. In panel B, we use the same specification, but add individual and household level controls. The *treatment group* (after the invasion) are respondents who had learned about the start of the war (from February 24th onwards). The *control group* (before the invasion) are respondents who received the questionnaire in February 2022, but before the beginning of the war. Regression results include the following controls: age, employment status, gender, education, income, region of residence, and household and city size. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The findings from an OLS regression in Panel A of Table 1 confirm the descriptive results. Short-term inflation expectations are the most affected by the outbreak of the war. Long-term inflation expectations also increase, but the magnitude is considerably smaller, which is in line with Dräger el al. (2022a). [7]

Without controlling for individual and household-level characteristics, we find that, after Russia's invasion of Ukraine, inflation expectations over the upcoming 12 months increased by around 1.1 percentage points. The increase in the average expected inflation over the next 5 and

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[7] The authors find results similar to ours for short- and long-term inflation expectations from surveying economics professors in Germany.

10 years is around 0.4 percentage points. All regression coefficients are statistically significant at the 1% or 5% levels. In panel B, we add controls including age, employment status, income, gender, education, region of residence of the respondent, and household and city size. The coefficient sizes remain roughly the same and stay highly statistically significant.

The size, direction and significance of the coefficients for short-term inflation expectations do not change when we vary the list of controls or when we use analytical weights (see Appendix A, Table A2). When we use the February wave only, the coefficient for short-term inflation expectations drops to 0.4-0.5 percentage points and remains statistically significant at the 1%-level, which indicates that, over time, the effect of the war on inflation expectations becomes stronger (see Appendix A, Table A3). The decrease in the size of the coefficient is expected, because, in this specification, the "after period" includes only responses within 5 days after the invasion day. To put these results into perspective, the change in the 12 months ahead inflation expectations from one month to the next was higher only in two months since the survey started in April 2020. The coefficients of long-term inflation expectations change and are non-significant in this setting (Appendix A, Table A3), potentially due to the small sample size.

In the main specification, we addressed outliers by trimming the responses of individuals who reported inflation expectations of less than -12% and more than 12%. Unfortunately, there is no unified approach in the literature of expectation formation on how to address the problem of outliers and unreasonable answers. Therefore, we repeat the main analysis reported in Table 1 by choosing three alternative approaches. In Appendix A, Table A4, we report the results with the main dependent variable trimmed at the interval [-5, 30] following the Survey of Consumers from the University of Michigan; in Table A5 we report the results for the main dependent variable trimmed at [-5, 25] as in Dräger et al. (2022b); in Table A6 we trim inflation expectations at the interval [-2, 15] as in Candia et al. (2021). As reported previously, the results remain unaffected for the short-term measure of inflation expectations. In only a few cases, the

coefficient for the very long-term inflation expectations measure (10 years) is affected. As noted earlier, this might be due to the very small sample size we have for the longer term inflation expectation measures.

In addition to our main analysis, the daily dynamics for short-term inflation expectations[8] reported in Figure 3 reinforce our finding in Table 1 that the longer the war progresses, the more convinced individuals are that the war will result in higher inflation in the coming year. The figure also rules out the possibility that any other event that preceded the day of the invasion could have already elevated inflation expectations[9].

To address any remaining concerns about unobserved heterogeneity, rule out that there are any pre-existing differences between the control and the treatment groups, and further strengthen our statement that it was mainly the outbreak of the war that elevated inflation expectations, we perform several complementary analyses in Appendix B. In Table B1 and Table B2, we show the results from a regression with individual fixed effects and a difference-in-difference regression. The results remain similar for the short – (12 months ahead) and long-term (5 years) inflation expectations. In some robustness checks the treatment coefficient is not statistically significant for the very long-term (10 years) inflation expectations, but the size of the coefficient stays the same in this case. Moreover, the results from a placebo regression, where we use data from the previous year (2021), suggest that the difference in inflation expectations is not driven by differences in characteristics between late and early respondents (Table A7), but by the major geopolitical event that happened on the 24th February (Table B3).

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[8] We cannot show similar graphs for the average expected inflation within the next 5 and 10 years due to the small sample sizes.
[9] In addition to the major events we examine in Section 4, on 23 February 2022 the Federal Cabinet approved raising the minimum wage in Germany to 12 euros per hour from 1 October 2022.

Figure 3. The daily pattern of inflation expectations
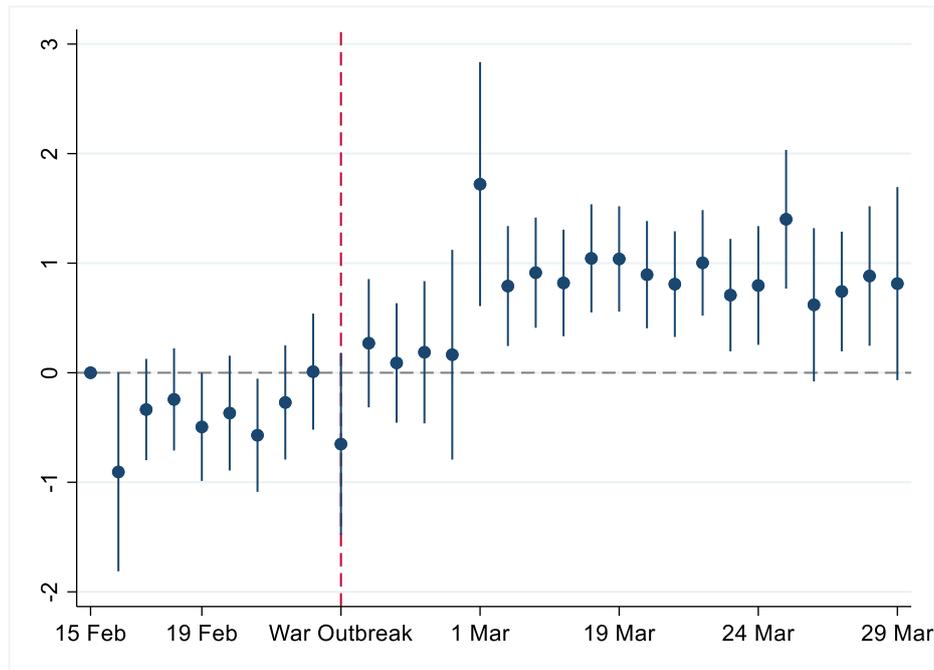
Note: The figure shows the coefficients plot graph for individuals' inflation expectations. The x-axis shows the dates, where "War Outbreak" represents the date of the invasion of Ukraine, the 24th of February. The plot is based on the results of an event study regression of inflation expectations on daily dummies. The base or omitted category is the 15th of February.

Overall, in this section we document that the onset of the war affected individuals' inflation expectations in Germany. We observe the strongest effect on short-term expectations. We can also confirm that individuals' long-term inflation expectations do not remain completely unaltered. However, it is important to emphasize that the effect on the long-term is not as large in magnitude as the estimated effect on the short-term expectations, and is not statistically significant in all cases.

4   Was the war an unexpected event?

Our main analysis relies on the argument that the invasion of Ukraine came as a rather unexpected event that most people believed would not actually happen.[10] Nonetheless, two significant instances preceded the invasion that could have led to some anticipation effects.

First, we consider an announcement made by US President Biden regarding the possibility of Russia attacking Ukraine. Second, we analyse a crucial signal that occurred before the invasion, the moment Russian President Putin signed a decree to recognize the Donetsk and Luhansk regions of Ukraine as independent republics.

The President of the United States announced on the 17th of February 2022 "…*we have reason to believe the Russian forces are planning to and intend to attack Ukraine in the coming days.*" (Biden, 2022). This was the first announcement made by a government official of a western country on the elevated threat of an invasion by Russia. Therefore, to examine whether individuals used this information to update their inflation expectations before the actual invasion occurred, we divide the sample into more than two periods: 1) pre-announcement, 2) announcement period, but before invasion, and 3) the invasion period. The "*pre-announcement*" period includes February 15th and 16th. The "*announcement period"* spans from the day that President Biden made the announcement until February 23rd. The "*invasion*" period is defined as the period after the invasion of Ukraine, i.e., from February 24th to the end of March.

In Table 2, we show summary statistics for each of the above-mentioned periods. There is no evidence for a significant effect of the announcement on the average inflation expectations of individuals for the next twelve months. The post-announcement pre-war expectations, at 4.7%,

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[10] In the news, there was also a considerable amount of coverage of the events preceding the invasion and there were many articles pointing to the direction of a full scale invasion not happening (e.g., BBC article titled "Ukraine crisis: Five reasons why Putin might not invade").

are only marginally higher than the pre-announcement expectations or expectations on the day of the announcement (4.6%). However, short-term inflation expectations rose to 5.6% between February 24th and March 29th.

For long-term inflation expectations, we do not have enough observations to report reliable statistics for the period prior to President Biden's announcement. However, we still see a difference between average long-term inflation expectations of individuals during the announcement and the invasion periods. Expected inflation over the next five years increased from 4.5% to 4.8% on average between the announcement and the invasion periods. The inflation expectations for the next ten years increased from 4.1% to 4.6% on average.

Table 2. Summary statistics: President Biden's announcement

	Before		Announcement		Invasion	
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean	N	Mean	N	Mean	N
Expected inflation, point prediction	4.60	111	4.67	4331	5.60	2558
Expected inflation (5 years)	.	.	4.48	464	4.77	638
Expected inflation (10 years)	.	.	4.12	444	4.64	588

Note: This table summarizes the average inflation expectations during three periods. In columns (1) and (2), we include observations from respondents who were interviewed during the days before President Biden announced that there was a high risk of a Russian invasion of Ukraine (i.e., February 17th). The announcement period (columns 3 and 4) spans from the day President Biden made the announcement, i.e., February 17th until the day before the invasion on February 24th. The invasion period (columns 5 and 6) includes observations from February 24th to the end of March. The columns with odd numbers contain the average expected inflation of individuals. The results are weighted.

The second event we look into is the day President Putin approved a decree to recognise the Donetsk and Luhansk regions in Ukraine as independent republics (February 21st). This development escalated tensions further and increased the chance that an invasion would actually take place. Therefore, we group the observations according to the date individuals filled in the questionnaire. We define three comparison groups: 1) before the recognition of the Donetsk and Luhansk regions as independent republics (February 15th-20th), 2) after the Russian decree,

but before the invasion (February 21st-23rd) and 3) the invasion period (February 24th – March 29th).

In Table 3, we can confirm that there was no anticipation effect on inflation expectations, even when Russia declared that the Donetsk and Luhansk regions in Ukraine were independent republics. Short-run inflation expectations of individuals were very similar before and after the declaration, at 4.7% and 4.6%, respectively. For long-term inflation expectations within the next five and ten years, we can confirm what we previously documented in Table 1. The effect is much weaker, but again we can exclude any anticipation during the period when the Donetsk and Luhansk regions were declared independent.

Table 3. Summary statistics: Donetsk and Luhansk declaration

	Before		Donetsk and Luhansk		Invasion	
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean	N	Mean	N	Mean	N
Expected inflation, point prediction	4.68	3600	4.64	842	5.60	2558
Expected inflation (5 years)	4.64	282	4.32	192	4.77	638
Expected inflation (10 years)	4.37	270	3.87	186	4.64	588

Note: This table summarizes the average inflation expectations during three periods. In columns (1) and (2), we include observations from respondents who were interviewed February 15th -20th. In columns (3) and (4) we report the results for individuals who were interviewed during the period February 21st -23rd. In columns (5) and (6) we report the results for individuals interviewed during the invasion (February 24th – March 29th).

Regression results for short-term inflation expectations in Table 4 that include the preceding events are in line with our previous findings. The coefficients for both Biden's announcement and the declaration about Donetsk and Luhansk are small and non-significant, while the coefficient for the after invasion period maintains both magnitude and statistical significance, as previously reported.

Table 4. Regression results for expected inflation in the next 12 months

	(1) Exp. Infl. Quant	(2) Exp. Infl. Quant
Panel A: Biden Announcement		
Announcement	-0.087	-0.069
	(-0.42)	(-0.33)
Invasion	0.969***	1.000***
	(4.65)	(4.74)
R^2	0.0537	0.0631
N	7000	6710
Controls	No	Yes
Panel B: Declaration of the Donetsk and Luhansk as independent republics		
Donetsk	-0.022	-0.017
	(-0.25)	(-0.19)
Invasion	1.051***	1.064***
	(18.95)	(18.88)
R^2	0.0537	0.0631
N	7000	6710
Controls	No	Yes

Note: The main dependent variable in the regression is the short-run inflation expectations of individuals in the next 12 months. The comparison (excluded) group is the period before the event happened. In column 2, we include the following controls: age, income, gender, education, employment status, region of residence of the respondent, and household size and city size. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5 Why do individuals associate the war with higher inflation?

We documented in the previous sections that that the war caused individuals to raise their expectations of upcoming inflation. It is important to understand why individuals reacted so strongly to this event in terms of their inflation predictions. We explore two channels that are widely discussed in the expectations formation literature.

The first aspect has to do with individuals' general sentiments about the future economic outlook. Several studies have shown that individuals tend to associate high inflation with bad economic outcomes, so they perceive a positive co-movement between inflation and unemployment rates (Kamdar, 2018; Binder, 2020). In the current context, the war created

further global supply chain distortions that aggravate the effect inherited from the COVID-19 pandemic. Hence, it is possible that the war made individuals more pessimistic about the future economic outlook and unemployment, leading to higher inflation expectations as well.

Another aspect that could elevate inflation expectations is anticipation of further energy price hikes. D'Acunto et al. (2021) show that individuals' inflation expectations are strongly influenced by the price signals they most often observe, and fuel prices were very salient when the invasion started. Additionally, Verbrugge & Higgins (2015) document that unusual changes in energy-prices influence movements in individuals' inflation expectations.

To explore these two channels we use several questions from the survey that ask individuals about their expectations on the development of the three aspects: 1) economic growth, 2) unemployment rates and 3) fuel prices.

Figure 4. Macro expectations of individuals, qualitative
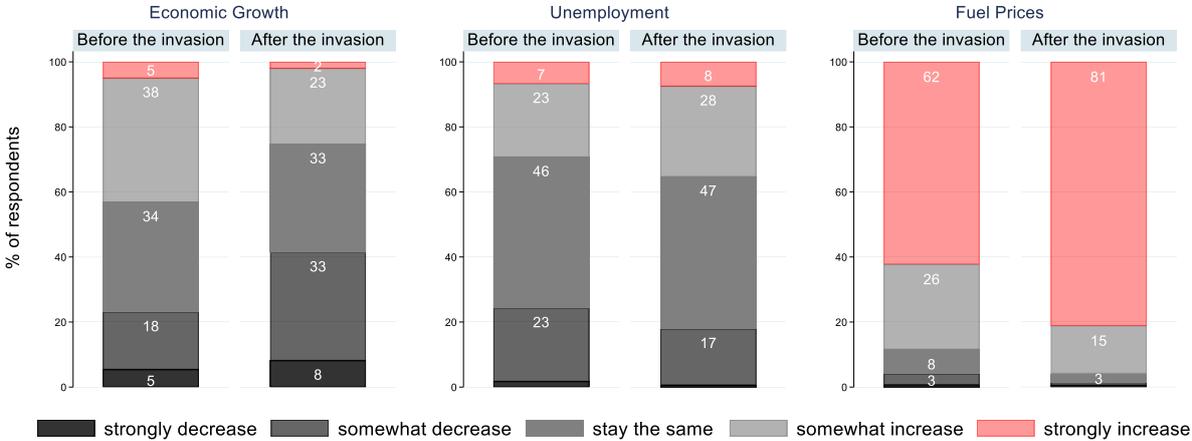
Note: The figure depicts the results from the following question in the February 2022 BOP-HH wave: "*What developments do you expect with regard to economic growth/unemployment/fuel prices over the next twelve months*?" Each split in the bars represents the share of respondents choosing a specific category from: *1 decrease significantly, 2 decrease slightly, 3 stay roughly the same, 4 increase slightly, 5 increase significantly*. In each of the three panels, we split the sample between individuals who answered before the invasion (February 15th – 23rd) and those who answered immediately after the invasion (February 24th - March 1st).

The results from Figure 4 indicate that individuals became more pessimistic in terms of economic growth and the unemployment rate for the coming 12 months. For example, before

the war started only 18% of respondents believed that economic growth in Germany would decline. After the war started, this share increased to 33%. Respondents also report significant concerns about soaring energy prices, which were already a matter of worry even before the war began. The share of respondents expecting a "*significant increase*" in fuel prices over the next twelve months is 81% immediately after the invasion began, about 20 percentage points higher than the share in the pre-invasion period.

We attempt to quantify the possible shift in expectations of economic outcomes or fuel prices by using these indicators as a dependent variable in the following regression model:

$$E_{it}(Y_{t+1}) = \alpha + \beta Treatment_t + \gamma X_{it} + \varepsilon_{it} \qquad (2)$$

where $E_{it}(Y_{t+1})$ is a matrix of binary variables indicating the expectation of an individual i about unemployment, economic growth, or fuel prices for the period $t+1$. In other words, we use the equation (2) with 3 different dependent variables, which are equal to one if an individual i expects 1) an increase in the unemployment rate (slight or significant), 2) a decrease in economic growth (slight or significant), and/or 3) an increase in fuel prices (slight or significant) over the next 12 months – $t+1$. $Treatment$ is a dummy variable, that is equal to one from February 24th onwards and zero before. X_{it} are individual level characteristics, including age, employment status, gender, education, income, region of residence, and household and city size. We use both a linear probability model (LPM- Table 5, Panel A) and a logit model (Table 5, Panel B).

The results confirm that the probability and odds of expecting an increase in the unemployment rate (column 1), a decrease in economic growth (column 2) and/or an increase in fuel prices (column 3) are significantly higher after the invasion. The computed odds ratios reported in Panel B show that the odds that a respondent will expect an increase in fuel prices are 3.5 higher after the invasion. For an expected decrease in economic growth and increase in the

unemployment rate, the odds are also higher in the period post-invasion (2.3 and 1.3, respectively). The results with LPM are both highly significant and in line with the results of the logit model.

Table 5. Mechanisms - before and after regression results

	(1)	(2)	(3)
	Increase in Unemployment	Decrease in Economic Growth	Increase in Fuel Prices
Panel A: LPM			
Before vs after invasion	0.047**	0.165***	0.084***
	(0.023)	(0.024)	(0.011)
Individual and household level controls	Yes	Yes	Yes
R^2	0.0277	0.0367	0.0181
N	4821	4821	4821
Panel B: Logit			
Before vs after invasion	1.263**	2.270***	3.488***
	(0.14)	(0.25)	(0.88)
Individual and household level controls	Yes	Yes	Yes
Pseudo R^2	0.0241	0.0337	0.0278
N	4821	4821	4821

Note: In panel A, we report the results of a LPM regression with a time dummy indicating the beginning of the war. In panel B, we use the logit specification and report the computed odds ratios. In both specifications we have individual and household level controls. The *treatment group* (after the invasion) comprises respondents who heard about the start of the war (from February 24th to March 1st). The *control group* (before the invasion) comprises respondents who received the questionnaire in February 2022, but before the war began. Regression results include the following controls: age, employment status, gender, education, income, region of residence, and household and city size. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Determining precisely which of the channels matters most is challenging, because individual respondents can simultaneously associate the war with multiple aspects that have direct implications for the economy and inflation. We attempt to quantify the effect arising from general pessimism about the economic outlook and the effect originating from interpreting the war as a signal related to energy prices by including measures for each in a regression

specification similar to equation (1). We include three indicator variables that equal one if individuals expect: 1) an increase in the unemployment rate, 2) a decrease in economic growth, and/or 3) an increase in fuel prices. The results shown in Table 6 cannot be interpreted causally, because of the endogeneity arising from the simultaneity between the outcome and control variables related to economic developments.

Table 6. Before and after regression results

	(1) Exp. Infl. 12M	(2) Exp. Infl. 5Y	(3) Exp. Infl. 10Y
Before vs after invasion	0.753^{***}	0.095	0.208
	(0.06)	(0.15)	(0.16)
Exp. Incr. Unempl	0.530^{***}	0.440^{***}	0.521^{***}
	(0.06)	(0.16)	(0.18)
Exp. Decr. Growth	0.758^{***}	0.844^{***}	0.205
	(0.07)	(0.16)	(0.18)
Exp. Incr. Fuel Prices	0.684^{***}	0.290	0.145
	(0.07)	(0.21)	(0.18)
R^2	0.129	0.109	0.0707
N	6687	1058	1000

Note: The treatment group (after the invasion) comprises respondents who heard about the start of the war (from February 24th onwards). The control group (before the invasion) comprises respondents who received the questionnaire in February, but before the war began. Regression results include the following controls: age, income, gender, education, employment status, region of residence of the respondent, and household size and city size. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Nevertheless, we can confirm a strong positive (negative) correlation between expected unemployment (economic growth) and the expected inflation rate, which indicates that the first channel matters in individuals' expectation formation. Furthermore, Table 6 confirms that individuals associate the war in Ukraine with a negative shock to the economy in Germany, which they anticipate could result in lower economic growth, higher unemployment rates, and/or soaring inflation. In addition, Table 6 confirms a positive correlation between expected fuel prices and inflation expectations for the upcoming twelve months.

Overall, we can conclude from this section that the fear of greater supply side shocks and increases in energy prices play an important role in elevating individuals' inflation expectations.

6 Conclusion

It is well established in the literature that individuals' inflation expectations can be an important influence on the real inflation rate. Inflation expectations can influence individuals' consumption and saving behaviour, affecting the current level of inflation and making it more difficult for central banks to achieve their price stability goals. Therefore, understanding how (large) shocks such as Russia's 2022 invasion of Ukraine influence individuals' expectations is crucially important.

In this study, to assess how the invasion affected individuals' inflation expectations, we treat its timing as an unanticipated event. We find that both short- and long-term inflation expectations increase with the invasion. The increase of short-term inflation expectations is around 1 percentage point, and survives all the robustness checks. When we widen the window of expectations to the upcoming 5 and 10 years, the increase in inflation expectations is only around 0.4 percentage points. Using the panel component and fixed-effects model instead of OLS does not affect the significance of our results on short- (12 months) and long-term (5 years) inflation expectations.

Possible mechanisms of these shifts in inflation expectations are individuals' fear of increasing fuel prices, higher unemployment, and lower economic growth. Our results are in line with the existing literature and with concerns that, in the current economic setting, large-scale political shocks can contribute to de-anchoring tendencies of inflation expectations. This study and further research on how persistent the increase in inflation expectations is could be useful for policymakers deciding on future action plans and policies for minimizing inflation and global economic stability in general, in the face of ongoing shocks to the system.

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Appendix A: Tables

Table A1. Summary statistics – before and after the invasion

	Before the Invasion			After the Invasion			Difference in means (t-test)
	Mean	Median	N	Mean	Median	N	
Expected inflation (12 months)	4.67	5.00	4442	5.60	5.50	2558	1.05***
Expected inflation (5 years)	4.50	4.00	474	4.77	5.00	638	0.42***
Expected inflation (10 years)	4.18	3.00	456	4.64	4.00	588	0.39**

Note: The treatment group (after the invasion) comprises respondents who learned of the start of the war (from February 24th onwards). The control group (before the invasion) comprises respondents who received the questionnaire in February 2022, but before the war began. We use analytical weights. Robust standard errors. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A2. Before and after results with analytical weights

	(1)	(2)	(3)
	Exp. Infl. 12M	Exp. Infl. 5Y	Exp. Infl. 10Y
Panel A			
Before vs after invasion	0.926***	0.267	0.457*
	(0.09)	(0.22)	(0.26)
Control mean	4.67	4.50	4.18
Individual and household level controls	No	No	No
R^2	0.0344	0.0028	0.0074
N	7000	1112	1044
Panel B			
Before vs after invasion	0.996***	0.174	0.350
	(0.09)	(0.21)	(0.23)
Control mean	4.66	4.59	4.20
Individual and household level controls	Yes	Yes	Yes
R^2	0.0514	0.0593	0.109
N	6696	1059	1002

Note: In panel A, we report the results from an OLS regression with a time dummy indicating the beginning of the war. We include only observations for February and March 2022. In panel B, we use the same specification, but add individual and household level controls. The *treatment group* (after the invasion) comprises respondents who heard about the start of the war (from February 24th onwards). The *control group* (before the invasion) comprises respondents who received the questionnaire in February 2022, but before the war began. Regression results include the following controls: age, employment status, gender, education, income, region of residence, and household and city size. Analytical weights are used. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3. Before and after results for February 2022 only

	(1)	(2)	(3)
	Exp. Infl. 12M	Exp. Infl. 5Y	Exp. Infl. 10Y
Panel A			
Before vs after invasion	0.478***	-0.220	0.079
	(0.11)	(0.23)	(0.26)
Control mean	4.67	4.50	4.18
Individual and household level controls	No	No	No
R^2	0.0044	0.0014	0.0002
N	4887	575	554
Panel B			
Before vs after invasion	0.422***	-0.331	-0.077
	(0.11)	(0.23)	(0.27)
Control mean	4.66	4.59	4.20
Individual and household level controls	Yes	Yes	Yes
R^2	0.0175	0.0990	0.0601
N	4657	544	525

Note: In panel A, we report the results from an OLS regression with a time dummy indicating the beginning of the war. We include only observations for the February wave. In panel B, we use the same specification, but add individual and household level controls. The *treatment group* comprises respondents who heard about the start of the war (from February 24th onwards). The *control group* comprises respondents who received the questionnaire in February 2022, but before the beginning of war. Regression results include the following controls: age, employment status, gender, education, income, region of residence, and household and city size. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4. Before and after results [-5,30]

	(1)	(2)	(3)
	Exp. Infl. 12M	Exp. Infl. 5Y	Exp. Infl. 10Y
Panel A			
Before vs after invasion	1.220***	0.502**	0.017
	(0.08)	(0.23)	(0.29)
Control mean	5.16	5.33	5.72
Individual and household level controls	No	No	No
R^2	0.0341	0.0041	0.0000
N	7146	1155	1104
Panel B			
Before vs after invasion	1.240***	0.508**	0.147
	(0.08)	(0.22)	(0.27)
Control mean	5.18	5.43	5.73
Individual and household level controls	Yes	Yes	Yes
R^2	0.0609	0.0692	0.0814
N	6835	1098	1058

Note: In panel A, we report the results from an OLS regression with a time dummy indicating the beginning of the war. We include only observations for February and March 2022. In panel B, we use the same specification, but add individual and household-level controls. The *treatment group* (after the invasion) comprises respondents who heard about the start of the war (from February 24th onwards). The *control group* (before the invasion) comprises respondents who received the questionnaire in February 2022, but before the war began. The main dependent variable is restricted to the interval between -5 and 30. Regression results include the following controls: age, employment status, gender, education, income, region of residence, and household and city size. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A5. Before and after results [-5,25]

	(1)	(2)	(3)
	Exp. Infl. 12M	Exp. Infl. 5Y	Exp. Infl. 10Y
	Panel A		
Before vs after invasion	1.196***	0.411**	0.216
	(0.07)	(0.20)	(0.24)
Control mean	5.04	5.28	5.37
Individual and household level controls	No	No	No
R^2	0.0434	0.0036	0.0008
N	7116	1148	1093
	Panel B		
Before vs after invasion	1.213***	0.439**	0.257
	(0.07)	(0.20)	(0.24)
Control mean	5.06	5.39	5.39
Individual and household level controls	Yes	Yes	Yes
R^2	0.0693	0.0728	0.0731
N	6808	1092	1049

Note: In panel A, we report the results from an OLS regression with a time dummy indicating the beginning of the war. We include only observations for February and March 2022. In panel B, we use the same specification, but add individual and household level controls. The *treatment group* (after the invasion) comprises respondents who heard about the start of the war (from February 24th onwards). The *control group* (before the invasion) comprises respondents who received the questionnaire in February 2022, but before the war began. The main dependent variable is restricted to the interval between -5 and 25. Regression results include the following controls: age, employment status, gender, education, income, region of residence, and household and city size. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6. Before and after results [-2,15]

	(1)	(2)	(3)
	Exp. Infl. 12M	Exp. Infl. 5Y	Exp. Infl. 10Y
Panel A			
Before vs after invasion	1.067***	0.285*	0.344**
	(0.05)	(0.16)	(0.17)
Control mean	4.87	4.96	4.55
Individual and household level controls	No	No	No
R^2	0.0553	0.0029	0.004
N	7005	1126	1056
Panel B			
Before vs after invasion	1.089***	0.298*	0.331*
	(0.05)	(0.16)	(0.17)
Control mean	4.87	5.03	5.59
Individual and household level controls	Yes	Yes	Yes
R^2	0.0760	0.0774	0.0673
N	6699	1070	1014

Note: In panel A, we report the results from an OLS regression with a time dummy indicating t the beginning of the war. We include only observations for February and March 2022. In panel B, we use the same specification, but add individual and household level controls. The *treatment group* (after the invasion) comprises respondents who heard about the start of the war (from February 24th onwards). The *control group* (before the invasion) comprises respondents who received the questionnaire in February 2022, but before the war began. The main dependent variable is restricted to the interval between -2 and 15. Regression results include the following controls: age, employment status, gender, education, income, region of residence, and household and city size. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A7. Difference in means between treatment and control

	(1) Before the war Mean	(2) After the war Mean	(3) Difference in means	P-values
Age	58.02	56.75	1.27***	(0.00)
Employment				
Employed	0.53	0.57	-0.03**	(0.01)
Not employed	0.03	0.03	0.00	(0.36)
In training	0.01	0.02	-0.00	(0.28)
Retired	0.42	0.39	0.03**	(0.01)
Income				
Less than 2,500	0.27	0.25	0.02	(0.07)
2,500-4,000	0.35	0.35	0.00	(0.98)
more than 4,000	0.37	0.39	-0.02	(0.10)
Gender	0.42	0.41	0.00	(0.92)
Education				
High-school or less	0.56	0.57	-0.01	(0.39)
Bachelor or equivalent	0.17	0.17	0.01	(0.57)
Higher than bachelor	0.26	0.26	0.01	(0.63)
Region				
East	0.18	0.17	0.00	(0.99)
North-West	0.17	0.17	-0.00	(0.89)
South-West	0.39	0.39	0.01	(0.65)
West-West	0.26	0.27	-0.00	(0.69)
HH size	2.12	2.21	-0.09***	(0.00)
Region size (inhabitants)				
< 5,000	0.14	0.12	0.01	(0.12)
5,000 - 20,000	0.26	0.25	0.01	(0.36)
20,000 - 100,000	0.27	0.30	-0.02*	(0.03)
100,000 - 500,000	0.15	0.16	-0.00	(0.92)
500.000	0.17	0.17	0.00	(0.82)
Observations	4388	2584	6972	

Note: The table shows the difference in means between the average characteristics of households before and after the start of the war in Ukraine. Columns (1) and (2) report the average age; share of respondents employed, not employed, in training or retired; share of individuals who have a net household income of less than 2,500 EUR per month, between 2,500 EUR – 4,000 EUR or more than 4,000 EUR; share of respondents who are women; share of respondents with less than a high-school degree, bachelor or equivalent, higher than bachelor degree; share of individuals who live in the east, north-west, south-west or west-west of Germany; average household size; and the share of individuals living in a region with fewer than 5,000 inhabitants, between 5,000 and 20,000, between 100,000 and 500,000, or with more than 500,000 inhabitants. Column (3) reports the difference in the average or share between the treatment and control groups. ***, **, * indicate statistical significance at the 1, 5, and 10 percent level.

Appendix B: Additional analyses

B.1 Fixed-effects analysis

To address any remaining concern about unobserved heterogeneity between the treatment and control groups, we use the panel component of the survey in an individual fixed-effects specification. To be able to add individual-level fixed effects, of course we use the panel respondents, unlike in the OLS regressions reported in the main part of the paper. The results in Table B1 indicate that the impact of war on both short – (12 months) and long-term (5 years) inflation expectations remain highly significant, and are even larger than with a simple OLS specification. This rules out the concern that our OLS results are biased upwards as a result of the unobserved systematic differences across individual respondents in the treatment and control groups. We lose significance for the main coefficient of interest only for the very long-term (10 years) inflation expectations, but the size of the coefficient stays the same.

Table B1. Before and after results with individual fixed effects

	(1) Exp. Infl. 12M	(2) Exp. Infl. 5Y	(3) Exp. Infl. 10Y
Before vs after invasion	1.310***	0.874***	0.392
	(0.04)	(0.27)	(0.28)
Control mean	4.67	4.50	4.18
Individual Fixed Effects	Yes	Yes	Yes
R^2 overall	0.068	0.004	0.005
Rho	0.629	0.692	0.594
N	9988	1825	1800

Note: We report the results from an FE regression using the panel component and implementing individual-level FEs, with a time dummy indicating the start of the war. We include only observations for February and March 2022. The *treatment group* (after the invasion) comprises respondents who heard about the start of the war (from February 24th onwards). The *control group* (before the invasion) comprises respondents who received the questionnaire in February 2022, but before the war began. Standard errors are clustered at individual level: * $p <$ 0.10, ** $p < 0.05$, *** $p < 0.01$.

B.2 Difference-in-differences analysis

In Section 3, we documented that the unexpected outbreak of war in Ukraine negatively affected individuals' inflation expectations. Although we argued that the day of the invasion was unexpected and not correlated to respondents' characteristics, the concern remains that the sample that responded later during the survey is inherently different from the sample that responded early on. We address this concern by drawing on the panel-observations of the survey participants who were interviewed in January 2022.[11] Using the longitudinal component of the data in conjunction with the day of the invasion as a natural experiment, we implement a difference-in-differences analysis with two groups and two periods.

We estimate the following specification:

$$E_{it}\left(\pi_{t+1,t+5,t+10}\right)$$
$$= \beta_0 + \beta_1 \cdot Treatment_{(War)} + \beta_2 \cdot POST + \beta_3 \cdot Treatment_{(War)} \times POST$$
$$+ \gamma X_{it} + \varepsilon_{it} \qquad (3)$$

Where $E_{it}\left(\pi_{t+1,t+5,t+10}\right)$ is the reported inflation rate for the 12 months, 5 years and 10 years horizon, respectively, for individual *i* at time *t*,. $Treatment_{(War)}$ is a dummy variable that takes the value of one if the respondent filled in the questionnaire on or after February 24th and in March 15th to 29th (*treatment group*). It takes a value of zero if they responded before the war started in February (*control group*). $POST$ indicates the survey periods, and is equal to zero if the survey was conducted in January 2022 and one if it took place in February or March 2022, which is the period of the invasion of Ukraine in our study. The coefficient of interest is β_3 which captures the causal effect of the war on inflation expectations of respondents.

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[11] The survey has a rotating panel design. Therefore, we cannot track the full sample of respondents in January 2022, but only a sub-sample.

We report the results from specification (3) in Table B2. The results on the main coefficient of interest, β_3 of the interaction term *Treatment (War) X After* corroborate the results from the OLS regression (Table 1). The reaction of respondents is particularly strong for short-run inflation. The results show that average expected short-term inflation increased by approximately 0.9 percentage points for the treatment group as compared to the control group (column 1). The results remain the same if we control for age, income, gender, education, employment status, region of residence, and household and city size (column 2). The magnitude of this impact decreases as the prediction horizon lengthens. The start of the war in Ukraine led to an increase in inflation expectations over the next 5 and 10 years, by respectively around 0.4 and 0.6 percentage points (columns 3 to 6). However, the estimated coefficients are not statistically significant. This can be partially attributed to the small sample size of respondents who reported their long-term inflation expectations[12].

Table B2. Difference-in-differences results

	(1) Exp. Infl. 12M	(2) Exp. Infl. 12M	(3) Exp. Infl. 5Y	(4) Exp. Infl. 5Y	(5) Exp. Infl. 10Y	(6) Exp. Infl. 10Y
Treatment (War) X Post	0.944***	0.982***	0.411	0.285	0.616	0.600
	(0.17)	(0.17)	(0.47)	(0.47)	(0.39)	(0.41)
Post	0.191***	0.176***	0.382**	0.371**	0.0955	0.0474
	(0.06)	(0.06)	(0.18)	(0.18)	(0.2)	(0.2)
Treatment (War)	0.111	0.0918	0.0118	0.116	-0.223	-0.211
	(0.16)	(0.16)	(0.45)	(0.45)	(0.36)	(0.37)
R^2	0.0532	0.0659	0.0177	0.0654	0.0085	0.0569
N	9249	8864	1414	1351	1343	1292
Controls	No	Yes	No	Yes	No	Yes

Note: In columns (1), (3) and (5), we report the results from the difference-in-differences regression without controls. In the other columns, we use the same specification, but add individual and household level controls. *Treatment (War)* is a dummy variable that takes the value of one if the respondents heard about the start of the war (from February 24th onwards). It takes a value of zero if s/he responded before the war started in February (*control group*). POST indicates the survey periods and it is equal to zero if the survey was conducted in January 2022 and one if it took place in February or March. Regressions in (2), (4) and (6) include the following controls: age, employment status, gender, education, income, region of residence, and household and city size. Robust standard errors. * p < 0.10, ** p < 0.05, *** p < 0.01.

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[12] In BOP-HH the question on short-term inflation expectations is asked every month to the full sample of respondents. For long-term inflation expectations the sample is split in two groups in every wave where one group is asked about their point prediction in five years and the other for the prediction in ten years. Furthermore, in some waves this question is asked only of new survey participants.

B.3 Placebo regression

Finally, to ensure that the samples from before and after the start of the war are not systematically different in other waves, for example, showing differences along unobserved heterogeneity between early and late respondents to the survey, we rely on a placebo regression from the previous waves of BOP-HH (February and March 2021). In this setting, we repeat the main regression analysis, with the placebo event date being the 24th of February, but for the year 2021. When we repeat the regression specification (1), but with the data from 2021, we find no significant effect on inflation expectations for each of the three prediction horizons (Appendix B, Table B3). This finding reinforces our main result: it was the start of the war that caused the divergence of inflation expectations between the control and the treatment groups, and it is not driven by unobserved differences between individuals asked before or after the 24th of February, i.e., early versus late respondent characteristics.

Table B3. Placebo regression for February and March 2021

	(1) Exp. Infl. 12M	(2) Exp. Infl. 5Y	(3) Exp. Infl. 10Y
Placebo	0.046	0.034	-0.019
	(0.07)	(0.10)	(0.12)
R^2	0.0001	0.0000	0.0000
N	5908	2367	2292
Controls	No	No	No

Note: The table reports the results for a placebo regression similar to the one reported for specification (1). We report the results from an OLS regression with a placebo time for the 24th of February 2021, one year before the start of the war in Ukraine. We include observations for February and March 2021. The *placebo treatment group* comprises the respondents who filled in the questionnaire on or after the 24th of February 2021. The *placebo control group* comprises respondents who received the questionnaire in February 2021, but before the 24th of February. The main dependent variable is restricted at the interval between -12 and 12. Robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix C: Survey questions

Short-term inflation expectations qualitative

Question: Do you think inflation or deflation is more likely <u>over the next twelve months</u>?

Note: Inflation is the percentage increase in the general price level. It is mostly measured using the consumer price index. A decrease in the price level is generally described as "deflation".

Please select one answer.

1 Inflation more likely
2 Deflation more likely

Short-term inflation expectations quantitative

If inflation:

Question: What do you think the rate of inflation in Germany will roughly be <u>over the next twelve months</u>?

If deflation:

Question: What do you think the rate of deflation in Germany will roughly be <u>over the next twelve months</u>?

Note: Inflation is the percentage increase in the general price level.

It is mostly measured using the consumer price index.

A decrease in the price level is generally described as "deflation".

Please enter a value in the input field (values may have one decimal place).

Input field percent

Long-term inflation expectations quantitative – 5 years on average

We would now like to ask you to consider what developments you expect in the long term.

Question: What value do you think the rate of inflation or deflation will take on average <u>over the next five years</u>?

Note: Please enter a value in the input field (values may have one decimal place). If you assume that prices will fall (deflation), please enter a negative value.

Input field percent

Long-term inflation expectations quantitative – 10 years on average

We would now like to ask you to consider what developments you expect in the long term.

Question: What value do you think the rate of inflation or deflation will take on average <u>over the next ten years</u>?

Note: Please enter a value in the input field (values may have one decimal place). If you assume that prices will fall (deflation), please enter a negative value.

Input field percent

Abstrakt

Ruská invaze na Ukrajinu představuje celou řadu nových výzev pro světovou ekonomiku, včetně dopadu na inflační očekávání jednotlivců. V tomto článku se snažíme kvantifikovat efekt invaze na krátkodobé a dlouhodobé inflační očekávání jednotlivců v Německu. Používáme panelová mikrodata z online šetření domácností sbíraná Německou spolkovou bankou (Bundesbank Online Panel – Households, zkráceně BOP-HH) za období od 15. února do 29. března roku 2022. Nepředvídatelný počátek války, která vypukla 24. února 2022, považujeme za přirozený experiment a zjišťujeme, že krátkodobá i dlouhodobá inflační očekávání se zvýšila bezprostředně po začátku invaze. Dlouhodobá inflační očekávání se zvýšila přibližně o 0,4 procentního bodu, zatímco dopad na krátkodobá inflační očekávání byl dvakrát tak velký – přibližně jeden procentní bod. Prozkoumali jsme možné mechanismy za zvýšením očekávání a navrhujeme vysvětlení, že za zvýšením částečně stojí obavy jednotlivců z rostoucích cen energií a rostoucí obecný pesimismus ohledně ekonomického vývoje. Naše výsledky naznačují, že velké ekonomické šoky mohou mít významný dopad na krátkodobá i dlouhodobá inflační očekávání.

Klíčová slova: inflační očekávání, ruská invaze na Ukrajinu, statistická šetření, přirozený experiment