Political Shocks and Inflation Expectations: Evidence from the 2022 Russian Invasion of Ukraine

Lena Dräger, Klaus Gründler, Niklas Potrafke

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Abstract

How do global political shocks influence individuals' expectations about economic outcomes? We run a unique survey on inflation expectations among 145 tenured economics professors in Germany and exploit the 2022 Russian invasion in Ukraine as a natural experiment to identify the effect of a global political shock on expectations about national inflation rates. We find that the Russian invasion increased short-run inflation expectations for 2022 by 0.75 percentage points. Treatment effects are smaller regarding mid-term expectations for 2023 (0.47 percentage points) and are close to zero for longer periods. Text analysis of open questions shows that experts increase their inflation expectations because they expect supply-side effects to become increasingly important after the invasion. Moreover, experts in the treatment group are less likely to favor an immediate reaction of monetary policy to the increased inflation, which gives further evidence of the shock being interpreted primarily as a supply-side shock.

Lena Dräger
Leibniz University Hannover

Klaus Gründler
ifo Institute – Leibniz Institute for
Economic Research
at the University of Munich,
University of Munich, CESifo

Niklas Potrafke**
ifo Institute – Leibniz Institute for
Economic Research
at the University of Munich,
University of Munich, CESifo
Poschingerstr. 5
81679 Munich, Germany
potrafke@ifo.de

1   Introduction

"The events last night are a turning point in the history of Europe"
— Emmanuel Macron, February 24, 2022

Incisive events, from political shocks to natural disasters, have large and long-lasting effects on individuals' beliefs, attitudes, and expectations about the future (Giuliano and Spilimbergo, 2014; Hanaoka et al., 2018; Jakiela and Ozier, 2019; Malmendier, 2021). In this paper, we take four steps to advance on the literature that studies the impact of political shocks on economic expectations. First, we focus on economic experts, who usually update expectations more rationally than households or firms when new information becomes available. Second, while previous work emphasises long-run consequences, we study the extent to which global political shocks result in an immediate update of economic expectations. Third, we evaluate the channels via which the political shock changes experts' expectations. Fourth, we examine whether such shocks also adjust policy recommendations of economic experts.

Understanding the drivers of agents' expectations is of first-order importance, because most economic decisions include inter-temporal components. Inflation expectations play an important role because they may affect households' behaviour via the consumption Euler equation (D'Acunto et al., 2018; Dräger and Nghiem, 2021), influence households' saving and investment decisions (Armantier et al., 2015; Malmendier and Steiny Wellsjo, 2020) and determine economic choices of firms (Coibion et al., 2020a,b). A burgeoning literature studies the determinants of inflation expectations (D'Acunto et al., 2022b). Little is known, however, about whether drastic political events can initiate an immediate adjustment of inflation expectations. There is also no evidence about how political shocks influence expectations and policy recommendations of well-informed economic experts.

We exploit the 2022 Russian invasion in Ukraine as a natural experiment to identify the effect of a global political shock on expectations about national inflation rates of economic experts. We conduct a unique survey on inflation expectations among all tenured economics professors at German universities between 22 February 2022 and 1 March 2022, asking participants about short- and long-run inflation expectations. Our results show that the Russian invasion immediately increased short-run inflation expectations by about 0.75 percentage points. We also find positive treatment effects on mid-term expectations, but the effect decays over longer periods. Using text mining

analyses on answers given to open-ended questions about the causes of inflation, we verify that the identified treatment effect is driven by the Russian invasion and not by other channels. We also find that by affecting expectations, the Russian invasion had profound effects on monetary policy recommendations: After the invasion, respondents were more likely to prefer no immediate policy reaction, suggesting that they viewed the effect of the shock on German inflation as being supply-side driven.

A major hurdle to research that aims to identify the immediate effects of exogenous shocks on individuals' expectations is that survey data can be collected after the event, but comparable data is usually not available for pre-shock periods (Chuang and Schechter, 2015). Our expert survey provides rich pre- and post-event data on the individual-level to tackle this challenge. We conducted the survey between 22 February 2022 and 1 March 2022, allowing us to compute treatment effects of the Russian invasion of Ukraine on 24 February 2022 by comparing mean expectations of experts surveyed before and after the invasion.

Several features make the 2022 Russian invasion of Ukraine, in statistical terms, a well-suited natural experiment to investigate the immediate effects of incisive events on inflation expectations. First, the invasion was a global political shock unparalleled in European history since World War II. In terms of consequences, few events may create a larger impact on the political landscape of Europe. We hence expect that experts closely followed the events that took place on 24 February 2022 and consider the Russian invasion when forming expectations about future states of the world. Second, until the invasion on 24 February 2022, it was unclear whether, and if so, when, Russia would ultimately invade Ukraine. Before the invasion, Russian officials strongly forswore any plans for an invasion of Ukraine. Starting with Putin's recognition of the people's republics of Donetsk and Luhansk on 21 February 2022, an invasion became increasingly possible. It was, however, impossible, even for international intelligence services, to forecast the exact day at which Russia invaded the Ukraine. Within the short period of days that we exploit in our setting, the invasion was random in the sense that it was impossible for participants to anticipate whether or when the invasion would take place. Most politicians were also surprised by the extent of the invasion targeting the whole country of Ukraine. Using global Google trends, we verify that there have been little anticipation effects of the invasion. Third, there is a close political and economic entanglement between Russia, the European Union (EU) and Germany, with Germany and the whole EU relying heavily on energy imports from Russia. Fourth, Germany,

the Ukraine and Russia share a long common history, including the German invasion of Ukraine under the Nazi regime and the Soviet occupation of East Germany that gave rise to the foundation of the German Democratic Republic (GDR). The division of Germany and its reunification continue to shape German politics and culture today. Spillover effects from the Russian invasion are hence particularly likely among individuals that were socialized in Germany.

Forming and updating inflation expectations requires the use of cognitive resources at several stages, including the collection of relevant information, the forecast of potential future states of the world, and the assessment of the likelihood of potential states. Previous research shows that forecast errors for inflation rates correlate with cognitive ability (D'Acunto et al., 2019). Mid-to-low IQ individuals have about 2.5 times higher forecast errors of 12-month-ahead inflation rates than high-IQ individuals (D'Acunto et al., 2022a). We focus on inflation expectations of economic experts to collect a comprehensive sample of individuals with high cognitive ability. This strategy allows for a clean identification of treatment effects without potential distorting effects from limited ability to infer new states of the worlds when new information becomes available. The individuals included in our survey are among the most prestigious economic policy advisors in Germany. Their opinions influence the national economic debates and the design of economic policies. In addition to expectations about inflation rates, we also survey respondents about monetary policy recommendations. Studying treatment effects in our sample of academic economists hence provides evidence about the policy discussion in response to incisive events.

The survey that we designed to elicit participants' inflation expectations consists of three parts. The first set of questions asks respondents' about their short-term, medium-term, and long-term inflation expectations. In the second part, we ask respondents to describe their perceived causes of inflation in free-text entry boxes. In the third part of the survey, participants are asked about monetary policy recommendations. We conducted the survey online between 22 February and 1 March 2022. An important aspect of this timing is that all participants in the control and treatment group had knowledge about Russia's recognition of the peoples' republics of Donetsk and Luhansk on 21 February 2022.

The key identifying assumption of using the 2022 Russian invasion of Ukraine as a natural experiment is that absent of the treatment event, respondents in the treatment and the control group are statistically identical. We manually collect biographic and

bibliographic characteristics of the respondents included in our sample using publicly available information from participants' websites and CVs, Google Scholar, websites of participants' universities and research institutions, as well as the academic database "Research Papers in Economics" (RePEc). We find no statistically significant differences between participants in the treatment and the control group across individual-level characteristics. We also find no differences in response behavior, measured via our software survey tool, between the groups.

Our benchmark estimates reveal that having information about the Russian invasion of Ukraine results in an immediate increase in short-run inflation expectations of about 0.75 percentage points. Treatment effects are smaller regarding mid-term expectations for 2023 (0.47 percentage points) and are close to zero for longer periods. We find no signs for treatment heterogeneity across individual-level characteristics, including gender, academic age, primary field of study, geographic location, and academic socialization in East Germany.

We use text analyses on open-ended questions about the causes of inflation to verify that the adjustment of inflation expectations was caused by the Russian invasion and not by other potential mechanisms. We ask participants to provide answers in free-text entry boxes to prevent priming of participants by listing possible causes. The results from our analysis consistently show that respondents in the treatment group are significantly more likely to report the Russian invasion to be a major driver of inflation. We find no effects for other potential causes that might drive our results. Our text analysis also shows that the majority of participants in the treatment and the control group believes that supply-side effects are the main driver of inflation at the time of our survey. Exploring the subjective macroeconomic models of respondents that write about the Russian invasion as a major cause of inflation, we examine combinations of topics explained in free-text answers. This analysis suggests that participants who report about the Russian invasion are increasingly concerned about a shortage in supply.

A major question is whether adjusted inflation expectations in response to the treatment also affect policy recommendations provided by economic experts. Our results suggest that this is the case. Participants who received the treatment are 28% less likely to recommend immediate action of the ECB. This result is consistent with the assessment of the inflation shock as being increasingly supply-side-driven of those participants that perceive the invasion to be a major cause of inflation.

Contribution to the literature: Our study is part of the literature that examines the formation of inflation expectations (see D'Acunto et al., 2022b for a recent survey). This literature typically analyzes inflation expectations by households, firm managers or professional forecasters (Dräger et al., 2016; Coibion et al., 2018b). Recent studies frequently run survey experiments with randomized control trials (RCTs) to identify causal effects of information or policy communication on respondents' inflation expectations (Lamla and Vinogradov, 2019; Coibion et al., 2021; Dräger et al., 2022).

How do large exogenous shocks affect inflation expectations? Binder (2020) evaluates this question at the beginning of the COVID-19 pandemic in a survey on U.S. households. She shows that consumers more concerned about the virus or more pessimistic about the economic outlook expect higher inflation. This is consistent with other studies showing that consumers view inflation as a negative signal and, hence, associate negative economic shocks with higher inflation (Shiller, 1997). In a study on U.S. households, firm managers and economics professors, Andre et al. (2021) present survey evidence on the narratives about the recent inflation surge. While economic experts give both supply-side and demand-side factors as reasons for the increase in inflation, households and firms are more likely to mention either supply-side factors such as high energy prices or generic stories related to the pandemic or policy mismanagement.

Our study contributes to this literature by evaluating the effect of a global political shock, the Russian invasion of Ukraine, on experts' inflation expectations. We differ from previous studies by being able to compare expectations prior to and after the treatment event. While our sample consists of well-informed economics professionals, the implications of the invasion for global energy and commodities markets lead to a profound impact on these experts' inflation expectations and monetary policy recommendations.

Our results connect to research on the role of economic experts in the design of economic policies. Previous studies have shown that the average forecast of experts predicts the outcomes of economic experiments quite well (DellaVigna and Pope, 2018a; DellaVigna and Pope, 2018b) and that updated information about the state of the world changes policy recommendations of international experts (Gründler and Potrafke, 2020). We contribute to this literature by taking one step back, examining the causes underlying experts' expectations. Consistent with previous findings, our results show that experts consider updated information about the state of the world for forming

their expectations, resulting in re-tailored policy recommendations.

We also relate to the literature on experience effects (e.g. Malmendier and Nagel, 2016; Malmendier et al., 2020; Malmendier, 2021; D'Acunto et al., 2021). This literature has shown that experiences over individuals' lifetime have long-lasting effects on their believes and choices and that individuals overweight more recent events ("recency bias"). Individuals perceive experienced events to be overly likely to occur again, even if there is full transparency about the actual likelihood. This bias causes decisions even of highly trained and well-informed professionals to be influenced by experiences (Malmendier et al., 2021). We contribute to this literature in two ways. We show that experiencing incisive events can give rise to immediate changes of expectations even if the events do not take place in the country of residence.

Our study also contributes to the literature using political events as natural experiments for causal identification. Previous research has used the US presidential election to identify the effect of exceptional politicians on economic expectations of international experts (Boumans et al., 2021). The results of our study are consistent with prior work, showing that major political shocks have far-reaching impact on the formation of expectations of academic professionals.

Organization: The remainder of this paper is organized as follows. Section (2) describes the events on 24 February 2022 and subsequent days when Russia invaded Ukraine. We then describe how the events are used as a natural experiment to investigate spillover effects of political shocks on inflation expectations. Section (3) describes the design of our survey. We describe our empirical setting in section (4), with results presented in section (5). Section (6) concludes.

2   The 2022 Russian invasion of Ukraine as a natural experiment

We first describe the events at 24 February 2022 and the subsequent days when the Russian President Vladimir Putin gave the order to invade Ukraine. We then discuss some specific features of the invasion that makes it, in statistical terms, a well-suited natural experiment to study the effect of political shocks on inflation expectations.

2.1 History and background

Tensions between Russia and the Ukraine date back until the dissolution of the Soviet Union in 1991. Although both countries retained close ties for decades, there were severe disputes about several geopolitical issues. A major sticking point during the 1990s was Ukraine's significant nuclear arsenal, which was ultimately abandoned in 1994 as part of the Budapest Memorandum on Security Assurances. Other points of contention included the division of the Black Sea Fleet, several disputes over gas during the 1990s and 2000s, and the planned free trade agreement with the EU, whose suspension in 2013 gave rise to the pro-European "Euromaiden" movement, which initiated a wave of demonstration and civil unrest in Ukraine. The movement culminated in the ousting of elected president Viktor Yanukovych and the overthrow of the government of the Ukraine (known as the "2014 Ukraine Revolution" or the "Revolution of Dignity").

The 2014 Ukraine revolution sparked unrest in the Russian-speaking eastern regions of Ukraine, which declared their continuing loyalty to Yanukovych, leading to the 2014 pro-Russian unrest in Ukraine. The so-called "Anti-Maidan" movement also gave rise to a political crisis in Crimea, which started as demonstrations but quickly escalated. On 22 and 23 February 2014, troops and special forces from Russia started moving to Crimea via Novorossiysk. Russian forces without insignias began taking control of the Crimean Peninsula on 27 February 2014, took hold of strategic positions and captured the Crimean parliament. The peninsula was formally annexed by Russia on 18 March 2014, after the Russian legislature approved the use of armed forces and Ukrainian military bases and installations were surrounded and besieged. Immediately after the annexation of Crimea, anti-government separatist groups formed in the Donetsk and Luhansk oblasts of Ukraine, collectively referred to as the "Donbas". Initially starting as demonstrations against the new Ukrainian government, Russia took advantage of the movement and began an invasion of the Donbas, which led to the 2014 War in Donbas. The years 2015 to 2020 were characterized by a frozen conflict phase, with many casualties on both the Ukrainian and the Russian side.

2.2 Events on 24 February 2022 and subsequent days

Starting in March 2021, Russia moved large quantities of equipment into Crimea and to the Ukrainian border. A second phase of military build-ups near the Russo-Ukrainian border took place from October 2021 to February 2022. On 21 February 2022, Rus-

sian president Vladimir Putin announced the recognition of the people's republics of Donetsk and Luhansk, and, in what he referred to as a "peacekeeping mission", directed the deployment of troops into the Donbas region. Russia started its invasion into the Ukraine on 24 February 2022, when president Putin announced that he decided to launch a "special military operation" in the Ukraine, seeking the "demilitarization and denazification" of Ukraine. Minutes after the announcement, the first explosions were reported in mayor Ukrainian cities, including Kyiv, Kharkiv, Odessa and the Donbas region.

The days between 24 February 2022 and 1 March 2022 saw fierce fighting between Russian and Ukrainian troops. The fighting initiated by heavy sanctions towards the Russian economy, the Russian central bank as well as several large Russian banks, and key Russian figures issued by the United States, the EU, Japan and other Western countries.

2.3   The Russian invasion as a natural experiment

Until the invasion on 24 February 2022, it was unclear whether, and if so, when, Putin would invade the Ukraine. We exploit the quasi-randomness of the timing of the invasion as a natural experiment to identify the effects of this major political shock on experts' inflation expectations for Germany. We run a survey among the universe of tenured economics professors at German universities between 22 February 2022 and 1 March 2022. Within the short period of days that we exploit in our setting, the invasion was random for the participants in our survey in the sense that it was impossible to anticipate by the participants whether or when the invasion would take place.

Figure (1) shows the setting of our natural experiment. An important feature of the empirical setting is that we run the survey after Vladimir Putin announced the recognition of the peoples' republics of Donetsk and Luhansk on 21 February 2022. After the recognition of the two Donbas republics, Putin send troops into the regions as part of a "peacekeeping mission". Although there was no fighting prior to the invasion starting on 24 February 2022, the events on 21 February 2022 created major tensions between Russia and Ukraine. The temporal structure of our survey ensures that all respondents knew about the events on 21 February 2022.

We start our survey on 22 February 2022. Two days later, Vladimir Putin announced the invasion of the Ukraine. All respondents who answered the survey before the official announcement of Putin at 24 February 2022 at 05:00 EET (UTC+2) are

9

Figure 1 DESCRIPTION OF THE DESIGN OF THE NATURAL EXPERIMENT.

Notes: The figure shows how our empirical setting exploits the 2022 Russian invasion of Ukraine as a natural experiment to examine how political shocks influence inflation expectations of economic experts. The figure illustrates how the main events of the invasion relate to our survey period.

part of the control group. Respondents who filled out the survey after the official announcement of the invasion are part of the treatment group.

A second important feature of the empirical setting is that during the survey period, respondents did not learn about the final outcome of the invasion. The invasion was still in process after the end of the survey period, and the outcome of the invasion was unknown to the participants in both groups. The fundamental change in the state of the world that occurred during the survey period is the Russian invasion of Ukraine, and the treatment in our natural experiment comes from the information about this change in the state of the world.

2.4 Could the invasion have been anticipated?

Before the Russian invasion on 24 February 2022, Russian officials strongly and repeatedly denied that there were any plans for an invasion of Ukraine. For instance, on

12 February 2022, Kremlin foreign affairs advisor Yuri Ushakov referred to warnings of an invasion as *"hysteria"*. Russian ambassador to the US Anatoly Antonov said on 20 February 2022 that *"there is no invasion. There is no such plan"*. Other Russian officials called allegations of an invasion *"fairytales"* (Taylor, 2022).[1] Contrary to the strong denials of Russia, US intelligence services and the US president Joe Biden issued early warnings regarding Russian plans to invade Ukraine. In a press conference on 18 February 2022, Biden said *"We have reason to believe the Russian forces are planning to and intend to attack Ukraine in the coming week — in the coming days. We believe that they will target Ukraine's capital, Kyiv, a city of 2.8 million innocent people. As of this moment, I'm convinced he's made the decision. We have reason to believe that"* (Biden, 2022).

Starting with Putin's recognition of the people's republics of Donetsk and Luhansk on 21 February 2022, an invasion became increasingly possible. However, it was impossible, even for US intelligence services, to forecast the exact day at which Russia would invade Ukraine. Data obtained from Google trends regarding Google searches for the Russian invasion, shown in Figure (B-1) in the appendix for the world and for Germany, also did not point to major anticipation effects before 24 February 2022. While interest scores were at (very) low levels on 23 February 2022 (scores between 0 and 10 on a scale from 0 to 100), search queries regarding the Russian invasion exploded on 24 February 2022, when interest scores reached the maximum value of 100.

Anticipation effects in our empirical set-up: Anticipation effects in the control group of our empirical setting would downwards bias our estimates, because the bar for finding effects would be higher if some experts in the control group (i.e. those surveyed before the invasion of Russia) already anticipated an invasion and reported higher expected inflation rates in response to their anticipation.

2.5 Further advantageous features of the empirical setting

On top of the quasi-randomness of the treatment in our setting, four additional specific features make the Russian invasion in Ukraine, in statistical terms, a well-suited laboratory to identify the spillover effects of political shocks on inflation expectations.

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[1]A full list of quotes from Russian government officials denying Russian plans to invade Ukraine (November 2021 – February 2022) can be accessed via https://www.factcheck.org/2022/02/russian-rhetoric-ahead-of-attack-against-ukraine-deny-deflect-mislead/.

First, the Russian invasion was closely followed by the international community and generated high public interest across the globe. The interest was particularly large in European countries and Germany. Figure (B-1) in the appendix shows that global interest in following the events in Ukraine surged after the Russian invasion. There is little dispute that the Russian invasion of Ukraine raises interest on the Russo-Ukrainian War beyond the countries that are directly involved. Given the high global attention, we have good reasons to assume that international experts closely followed the events around 24 February 2022.

Second, the Russian invasion of Ukraine is likely to have a significant and long-lasting impact on the world's geopolitical landscape. Many observers describe the invasion as plunging "Europe into its most serious military conflict since World War II" (Herb et al., 2022). Many countries, particularly from the Western world, reacted with economic sanctions that were unparalleled in history.

Third, the EU and Germany are economically closely connected with Russia. Relatedly, many countries in Europe are heavily dependent on oil and gas imports from Russia. Russia is Europe's largest energy supplier, including gas (41.1% of total EU imports), crude oil (26.9% of total EU imports) and solid fuel (46.7% of total EU imports) (Eurostat, 2022). Therefore, political disputes with Russia have the potential to substantially increase energy prices in Europe, with direct effects on the inflation rate. In addition, Russia is an important exporter of commodities. Economic sanctions on trade are thus likely to further deepen supply-chain problems for industrial production. Considering total trade flows, Russia is the fifth largest trading partner of the EU (Eurostat, 2022).

Fourth, Germany, the Ukraine and Russia share a long common history. On 22 June 1941, Nazi Germany launched "Operation Barbarossa" against the Soviet Union. The German invasion gave rise to a transfer of Soviet Ukrainian territory to a separate German civilian occupation regime on September 1941, which was called the "Reichskommissariat Ukraine" (RKU). The occupation of Ukraine by Nazi Germany caused the deaths of millions of civilians. After the defeat of the Nazi regime, the Soviet Union obtained one of the four Allied occupation zones of Germany, known as the "Soviet Occupation Zone" (SBZ), located in the eastern part of Germany. On 7 October 1949, the Soviet zone became the German Democratic Republic (GDR), which lasted until the German reunification in 1990. The division of Germany and its reunification were key defining aspects of German politics and culture in the second half of the 20th century

and have profound influence on the German political landscape until today. Given the close entanglement of the three countries, the invasion of Ukraine by Russia was likely followed very closely by the experts in our sample.

3 The survey

3.1 Design of the survey

We exploit the unique infrastructure of the "Economists panel" (German: *"Ökonomen-panel"*) conducted jointly by the ifo Institute in Munich and the "Frankfurter Allgemeine Zeitung" (FAZ) to conduct our survey.[2] The Economists panel regularly surveys all tenured German economics professors, asking them about their evaluation of recent economic and political events and their recommendations regarding economic policy. The results of the Economists panel are regularly published in the ifo Institute's outlet *"ifo Schnelldienst"* and in the FAZ, making them transparent to a broad audience in the economic and political sphere.[3] The survey was conducted as the 38th Economists panel.

Conducting the survey via the Economists panel program of the ifo Institute equipped us with the infrastructure to quickly reach out to the universe of economics professors at German universities. A total of 145 economics professors participated in the survey (about one fourth of all tenured economics professors at German universities). About two thirds of the participants were in the control group and one third in the treatment group. The survey period was 22 February 2022 to 1 March 2022. We distributed our survey via the software *qualtrics*. Responses were recorded online.

3.2 Questions included in the survey

The full survey is available in Figures (B-2)–(B-6) in the appendix, showing the design of the web interface and the wording of our questions. Our survey includes three types of questions.

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[2]The FAZ is has the second largest circulation nationwide and the largest circulation internationally of all high-profile national newspapers in Germany. It has a circulation of the daily of about 200,000 printed copies.

[3]Further information about the panel can be acquired via https://www.ifo.de/en/node/42950.

Question set (I): Inflation expectations. The first set of questions elicits respondents' short-term, medium-term, and long-term inflation expectations (see Figure B-2 in the appendix). Participants are asked to report their expectations on a scale reaching from -10% to +10% using a slider. There is also an option to tick a box saying "Don't know".

Question set (II): Causes of inflation. In the second part of the survey, participants are asked to describe their perceived causes of inflation (see Figure B-3 in the appendix). Participants are asked to give a brief description of the causes of inflation in an open-ended free-text entry box.

Question set (III): Monetary policy recommendation. The third part of the survey elicits participants' monetary policy recommendations (see Figures B-4–B-6 in the appendix). Respondents are asked whether the ECB should take immediate measures to tackle inflation (Figure B-4), and if so, which measures the ECB should take (Figure B-5). The survey also asks participants about the optimal key interest rate for main refinancing operation by the end of 2022 (Figure B-6).

4 Empirical strategy

4.1 Hypothesis

Standard learning models relate individuals' expectations regarding the inflation rate in the next period, π^{t+1}, to some perceived state of the world $E[\Omega^t]$

$$\pi^{t+1} = \alpha + \beta E[\Omega^t] + u^{t+1}, \tag{1}$$

where the state of the world reflects the available price signals at period t. In adaptive learning models, for instance, the state of the world is usually described by the observed inflation rate in t. In this case, individuals estimate the parameters $b = (\alpha, \beta)'$ of an AR(1) model of inflation. Many variations of this standard setting exist (see Evans and Honkapohja, 1999, 2012 and Coibion et al., 2018a for surveys). Acquiring information, however, is costly, and hence agents' inference of the state of the world depends on their willingness and ability to collect information (e.g. Sims, 2003; Branch, 2004).

The 2022 Russian invasion in Ukraine was among the most fundamental political shocks in Europe since World War II (see section 2). In terms of the simple heuristic described in equation (1), the invasion was a fundamental change in the state of the world. Given the close political and economic entanglement between Germany, the Ukraine and Russia, news about a Russian invasion of Ukraine provides important price signals. The invasion initiated a threat to global supply chains and brought about the fear of a further spread of the war with adverse supply-side effects on global markets. We hence hypothesize that the price signals available to respondents after the invasion, $\Omega^{t'}$, are more reflective of an inflationary scenario than the price signals observed by respondents before the invasion, Ω^t, i.e.

$$\Omega^{t'} > \Omega^t. \tag{2}$$

The invasion also sparked huge public attention and media coverage. It hence provided updated price signals that could, unlike in other times, be obtained with relatively little cost by all agents. Taken together, our key hypothesis is:

Hypothesis 1 (H1). *Participants who knew about the Russian invasion of Ukraine expect higher inflation rates in Germany than participants surveyed prior to the invasion.*

4.2 Econometric model

Our empirical strategy is designed to examine whether the 2022 Russian invasion in the Ukraine has influenced experts' expectations about the future inflation rate in Germany. Each respondent has filled out our questionnaire once, but individuals differ in the day they participated in our survey. Given the importance of the temporal variation, we index the variables by the subscript (t) for days. We estimate variants of the model

$$\pi^{\tau}_{e,(t)} = \gamma T_e + \mathbf{A}_{t'}\zeta + \mathbf{X}_e\boldsymbol{\mu} + \eta E_e + \varepsilon_{e,(t)}, \tag{3}$$

where the dependent variable, $\pi^{\tau}_{e,(t)}$ denotes expectations about the inflation rate π of expert e who filled the survey on day t. We elicit inflation expectations for three time-horizons, denoted by τ. The treatment variable T_e indicates whether experts filled the survey before ($T_e = 0$) or after ($T_e = 1$) the invasion of Russia in the Ukraine on 24 February 2022. The parameter γ measures the treatment effect.

In the most parsimonious model specification, we only consider the treatment status T_e. Identifying an effect based on this model is afflicted with three key challenges. First, there may be heterogeneity in individual-level characteristics (e.g. gender, age cohorts, primary field of study, or academic socialization) that may correlate with inflation expectations. Second, there may be confounding events between the treatment and the day experts participated in the survey. Third, experts may differ in the effort they put into filling the survey. We gradually augment the parsimonious model to tackles these challenges. We include a set of variables measuring socio-demographic and academic characteristics of participants, denoted by the matrix $\mathbf{X}_e$. The model also includes fixed effects for each day t' of the post-treatment period to rule out distorting effects from confounding events, implemented by a set of dummy variables ($\mathbf{A}_{t'}$). Fixed effects for post-invasion days also control for realized price increases or news reporting after the invasion that might be observable for experts and that may influence their inflation expectations. Finally, we include the time (in seconds) experts took to fill out the survey (E_e). This variable accounts for differences in the endeavor of experts and controls for "box checking". We also expect this variable to be correlated with other unobserved personality traits of experts which are not captured by the individual-level characteristics of experts.

4.3   Key identifying assumption and balance tests

The key identifying assumption underlying the model specification in equation (3) requires that absent of the treatment, the control and the treatment groups are statistically identical, i.e.

$$\mathrm{E}[\varepsilon_{e,(t)}|T_e = 1] = \mathrm{E}[\varepsilon_{e,(t)}|T_e = 0] = 0. \tag{4}$$

This assumption cannot be tested directly because $\varepsilon_{e,(t)}$ is unobserved. For random treatments, the identifying assumption should be fulfilled by construction (see, e.g., Bruhn and McKenzie, 2009). To statistically test whether the assumption in equation (4) is *likely* to hold, we compare the sample means of observable characteristics between experts in the treatment and the control group.

We manually collect biographic, geographic and bibliographic characteristics for all participants included in our survey using publicly available information from participants' websites and CVs, Google Scholar, websites of participants' universities and

research institutions, as well as the academic database "Research Papers in Economics" (RePEc). The list of individual-level characteristics includes participants' gender, primary field of study, and academic age (measured by the year in which participants obtained their PhD).[4] We also create two variables to account for the close historical entanglement of East Germany and the Soviet Union that may shape participants' perceptions about the 2022 Russian invasion of Ukraine. We code the location of participants' affiliation (East Germany versus West Germany), and the location of the affiliation from which participants obtained their PhD (East Germany versus West Germany). We also account for potential differences in the effort that participants put into answering our questions via the time (measured in seconds) that participants used to fill our survey.

Table (A-1) reports averages for all individual-level variables by treatment status. The table also reports results from t tests that inspect whether there are statistically significant differences between respondents included in the control and the treatment group. The results from these balanced tests provide no evidence for differences between the treatment group and the control group across biographic, geographic, and bibliographic characteristics. We hence conclude that the key identifying assumption of equation (4) is likely to be satisfied.

5 Results

5.1 Benchmark results

Table (1) reports our baseline results for short-run inflation expectations for the year 2022. In Columns (I)–(IV), we present the treatment effect of the 2022 Russian invasion of Ukraine for four model specifications. The most parsimonious model, reported in Column (I), only accounts for the treatment effect. The specifications in Columns (II)–(IV) gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV).

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[4]We collect information about the fields in which authors published using NEP and JEL codes of the authors' paper. Data comes from RePEc, Google scholar, and individual websites of authors. Information regarding academic age stems from participants' CVs, their individual websites and the websites of their affiliations.

The main result of Table (1) is that knowledge about the Russian invasion of Ukraine increased the expected rate of inflation for the year 2022. The effect is economically and statistically significant. In the most parsimonious model, average short-run inflation expectations of participants in the treatment group are about 0.75 percentage points higher than expectations of respondents in the control group. This effect is statistically significant at the 1% level ($t = 3.42$). The treatment effects are similar in size when we account for participants' effort (Column II) and biographic characteristics (Column III). The parameter estimate is slightly larger when we include fixed effects for each day of the post-invasion period to account for confounding events after the invasion. To examine whether the treatment effects differ across model specifications, we run Wald tests that compare the parameter estimates of Columns (II)–(IV) to the treatment effects identified in the parsimonious specification reported in Column (I). For all models, the tests do not suggest that the effect size is statistically distinguishable from the benchmark treatment effect of 0.75 percentage points.

Robustness: To maximize the sample size, we use all available observations for our benchmark results. For seven of the included participants, the biographic variables include missing values. In Table (A-2) in the appendix, we report results from re-estimates of the benchmark specifications using a unified sample. Doing so does not change the inferences, and we cannot reject the null of a treatment effect of 0.75 percentage points identified in our benchmark estimates. The Russian invasion was followed by severe sanctions imposed by Western economies. For Germany, sanctions were first announced on Sunday, 27 February 2022. To distinguish the effect of the invasion from a potential effect of the sanctions, Table (A-3) in the appendix presents results when we exclude all participants after the announcement of the sanctions, with little effect on the inferences.

5.2 Temporal structure of the treatment effects

Our benchmark estimates present treatment effects for short-term inflation expectations for the year 2022. We now examine the temporal structure of the treatment by studying medium-term (for the year 2023) and long-term (for the year 2026) inflation expectations. Table (A-4) in the appendix reports re-estimates of the benchmark specifications for medium-term and long-term inflation expectations. Figure (2) portrays the treatment effects obtained via the parsimonious model specifications.

Table 1 THE 2022 RUSSIAN INVASION OF UKRAINE AND SHORT-RUN INFLATION EXPECTATIONS—BASELINE-RESULTS

Dependent variable: Inflation expectations for the year 2022

|	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	0.746***	0.766***	0.706***	0.969**
	(0.218)	(0.226)	(0.217)	(0.465)
Observations (# professors)	138	138	131	131
R-Squared	0.071	0.073	0.100	0.118
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes
Equal. (p-val)	–	0.943	0.838	0.639

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on inflation expectations of tenured economics university professors in Germany. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). "Equal. (p-val)" reports p-values on a Wald test that compares the estimated parameters of Columns (I)-(IV) with the treatment effect identified in the parsimonious model shown in Column (I). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

 *** Significant at the 1 percent level,
 ** Significant at the 5 percent level

  The results show that the 2022 Russian invasion of Ukraine particularly affected short-term inflation expectations. For longer time horizons, the treatment effects decline. Regarding medium-term inflation expectations for the year 2023, the treatment effect decreases to 0.47 percentage points. The difference between the control and the treatment group is statistically significant at the 10% level ($t = 1.89$), except for the specification including daily fixed effects where we find no statistically significant effect. We find no statistically significant effect regarding long-term inflation expectations for the year 2026. The difference in average expectations between the control and the treatment group (16 percentage points) is far from statistical significance ($t = 0.63$).

Figure 2 RUSSIAN INVASION OF UKRAINE AND INFLATION EXPECTATIONS—
TEMPORAL STRUCTURE OF THE TREATMENT EFFECTS

(a) Short-term expectations   **(b)** Medium-term expectations   **(c)** Long-term expectations
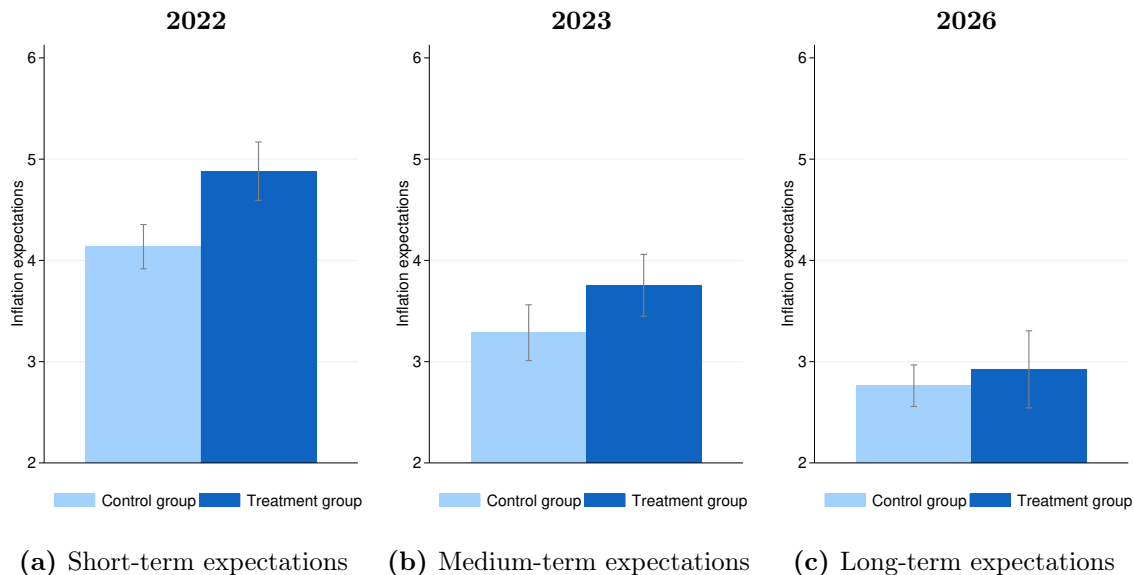
Notes: The figure shows average inflation expectations in the control and the treatment group, graphically illustrating the estimates of the parsimonious model specification reported in Column (I) of Table (1). The figure presents results for three time horizons, including short-term inflation expectations for the year 2022 (panel on the left-hand side), medium-term inflation expectations for the year 2023 (panel in the middle) and long-term inflation expectations for the year 2026 (panel on the right-hand side). Accompanying estimates for all model specifications reported in the set of benchmark estimates are shown in Table (A-4) in the appendix.

5.3 Treatment heterogeneity

The participants in our sample are recruited from the universe of tenured economics professors at German universities. We examine whether there is heterogeneity in the treatment effect across socio-demographic and academic characteristics of the participants. First, the empirical literature has shown that inflation expectations differ across gender (D'Acunto et al., 2020). Second, we might expect that participants' field of expertise influences the accuracy of their predictions about key macroeconomic variables. To test for treatment heterogeneity across participants' field of expertise, we code a dummy variable that is 1 if a participant has published articles in the core field of macroeconomics. Recent studies have also shown that inflation expectations differ across age cohorts and that personal lifetime exposures to price signals contribute to these age differences (e.g. Malmendier and Nagel, 2016; D'Acunto et al., 2022b). In

particular, personal lifetime experience has been shown to also influence inflation expectations (e.g. Malmendier, 2021; Malmendier et al., 2021). We account for heterogeneity in treatment effects across academic age cohorts by coding the decade (from the 1970s to the 2010s) in which participants' received their PhD.[5] Finally, we account for the close history of East Germany and the Soviet Union that may shape participants' perceptions about the 2022 Russian invasion of Ukraine. To this end, we code dummy variables that measure whether individuals are affiliated with a university in East Germany or whether they have obtained their PhD from a university located in East Germany.

To examine treatment heterogeneity we augment our parsimonious model specification of equation (3) with interactions between the treatment and individual-level characteristics of respondents

$$\pi_{et}^{\tau} = \gamma T_{et} + \rho\big(T_{et} \times C_e\big) + \alpha C_e + \varepsilon_{et}, \tag{5}$$

where C_e denote socio-demographic and academic characteristics of participants. Table (A-5) in the appendix reports the results, along with p-values on a Wald test inspecting whether the baseline parameter estimate and the coefficient obtained in our heterogeneity exercise are statistically distinguishable. The results show no sign for treatment heterogeneity across the individual-level variables included in Table (A-5). For each specification, we cannot reject the null of statistical equivalence between the baseline results and the estimates of Table (A-5).

5.4   Theoretical mechanism

Validation of the central channel: The key hypothesis underlying our empirical setting is that the political shock of Russia invading Ukraine has increased agents' inflation expectations. To distinguish the channel initiated by the Russian invasion from other potential mechanisms, our survey includes an open-ended question that asks participants to write a brief statement about their perceived causes of inflation in Germany in a free-text entry box (see Figure B-3 in the appendix). We use free-entry boxes to prevent priming of participants. We visualize the words used for answering this question in Figure (B-7) in the appendix, distinguishing between participants in the control and the treatment group. We also list the top words used by participants,

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[5]Information stems from participants' CVs, their individual websites and the websites of their affiliations.

the absolute and relative frequency of words, and an English language equivalent of the original German words.
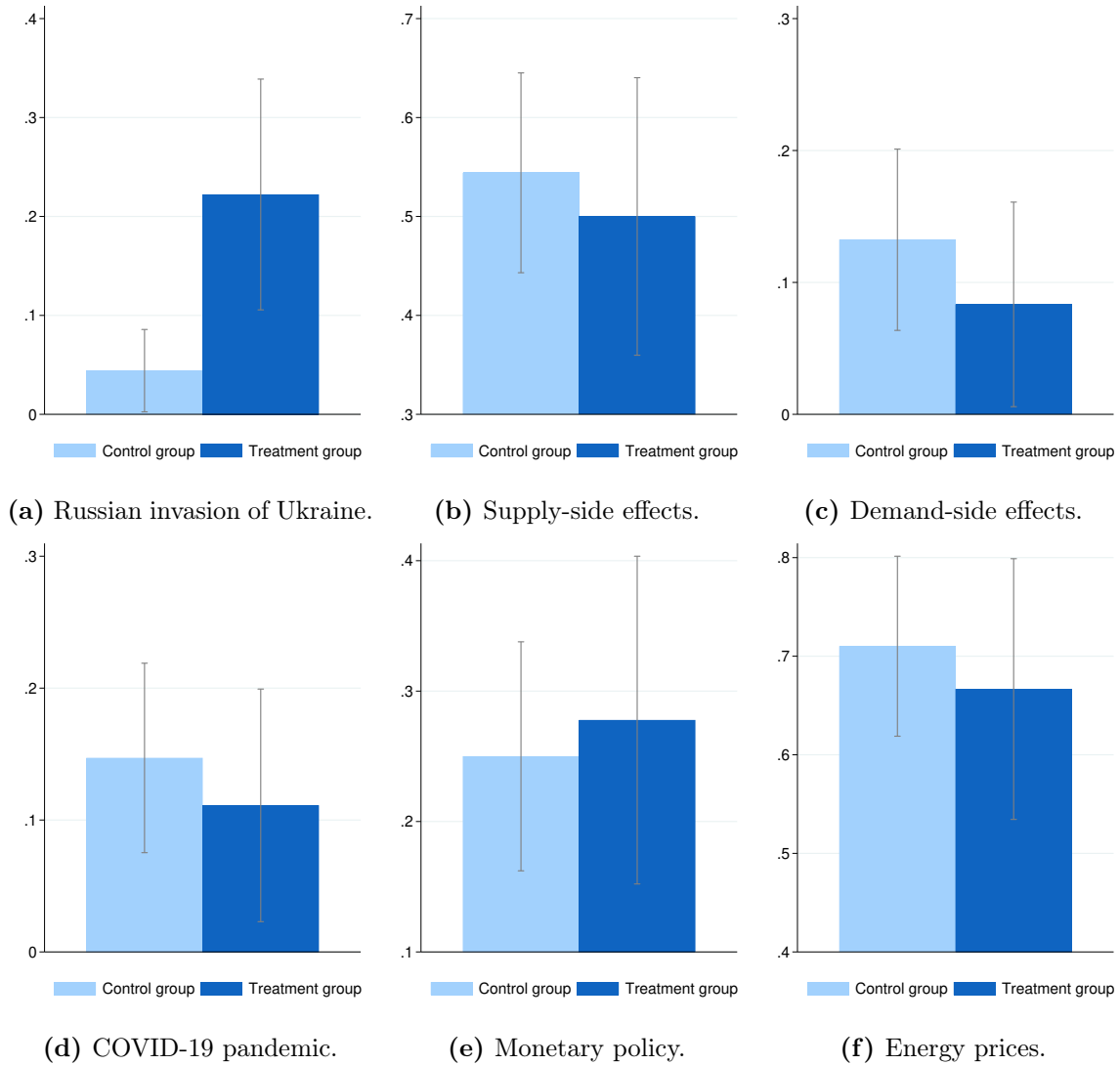
The frequency of words used by participants in our survey allows us to gain important insights about the perceived causes of inflation. We find that the overwhelming majority of respondents in both groups believe that inflation is driven mainly by supply-side factors. "Energy prices", "shortage of supply", 'supply chain", "energy", and "commodity prices" rank among the most frequently used words in both the control group and the treatment group. Many participants report that supply-side factors are initiated or reinforced by the global Covid-19 pandemic. Expert # 44 in our sample summarizes this oft-cited argument by writing about a *"supply-side shock in the wake of the global Covid-19 pandemic"*.

Consistent with our hypothesis, the words "Ukraine", "Russia", and "war" are among the most frequently used words in the treatment group. Taken together, these words appear in roughly 40% of all free-text answers of individuals in the treatment group, making the Russian invasion of Ukraine the most frequently quoted cause of inflation expectations in this group. In contrast, such words hardly appear in the control group.

To investigate differences in the perceived causes of inflation between the treatment and the control group in more detail, we manually code answers to the free-text questions about the causes of inflation. We create dummy variables that indicate whether respondents refer to one of the following causes of inflation: (a) the Russian invasion of Ukraine, (b) supply-side effects, (c) demand-side effects, (d) the COVID-19 pandemic, (e) monetary policy, and (f) energy prices. The categories are retrieved based on the most frequent answers given to our question about the causes of inflation (see Figure B-7 in the appendix).

We re-estimate our baseline model specifications using the dummy variables of perceived causes of inflation as the dependent variables. Results for all model specifications are presented in Tables (A-6)–(A-11) in the appendix and visualized in Figure (3). Consistent with the inferences drawn from the word clouds and frequencies shown in Figure (B-7), individuals in the treatment group are considerably more likely to mention the 2022 Russian invasion of Ukraine as a cause for inflation. This difference is statistically significant at the 5% level ($t = 2.405$). We do not find any statistically significant differences between the treatment and the control group for any of the other causes mentioned by participants. These results provide strong evidence that the treatment effects are caused by the Russian invasion of Ukraine and not directly by

Figure 3 RUSSIAN INVASION OF UKRAINE AND INFLATION EXPECTATIONS—TREATMENT EFFECTS ON THE PERCEIVED CAUSES OF INFLATION.

(a) Russian invasion of Ukraine.   **(b)** Supply-side effects.   **(c)** Demand-side effects.

(d) COVID-19 pandemic.   **(e)** Monetary policy.   **(f)** Energy prices.

Notes: The figure shows answers to the open-ended question in our survey, asking participants about their assessment of the causes of inflation in Germany. Answers are manually coded via dummy variables that capture whether respondents have included specific topics in their response. The figure shows how the treatment status (having knowledge about the Russian invasion of Ukraine) influences answers given regarding the causes of inflation.

other potential channels.

Why do respondents think that the war increases inflation? A central and pending question is what subjective macroeconomic model respondents have in mind that leads them to report higher rates of inflation in response to the Russian invasion. Reading the free-text answers, we find that many participants believe that the Russian invasion has intensified global supply bottlenecks. For instance, respondent #124 argues that *"energy prices increase further due to the Russian war of aggression against Ukraine"*. To more systematically explore the perceived channels underlying the treatment effects, we examine which other factors respondents that report about the invasion write about.

For each of the topics included in Figure (3), we code dummy variables that assume a value of 1 if the topic is mentioned by participants that report in their free-text answer about the Russian invasion (zero otherwise). We then use these dummy variables as the dependent variables in the parsimonious model specification of our benchmark regressions. The results are reported in Table (A-12) in the appendix.[6] We find that individuals who received the treatment are significantly more likely to mention the Russian invasion in combination with supply-side factors than participants in the control group ($t = 2.10$). We also find positive parameter estimates for a combination of the war and energy prices ($t = 1.55$). Consistent with the hypothesis of inflation being increasingly supply-side driven after the invasion, the results do not suggest that participants perceive the COVID-19 pandemic or monetary policy factors to gain importance after the Russian invasion.

5.5 Effects on monetary policy recommendations

What are the consequences of the identified treatment effects for economic policy? Many of the included economics professors in our survey are renowned policy advisors whose opinions and recommendations influence the public discussion and the political sphere in Germany. In Question Q4 of our survey, we ask whether participants believe that the ECB should take immediate action to bring down inflation (see Figure B-4 in the appendix) and which measures the ECB should take (see Figure B-5 in the appendix). We next examine whether receiving the treatment alters recommendations

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[6]We cannot compute results for the demand side as a possible channel, because no respondent reports that the war has led to an increase in demand-side driven inflation.

Table 2 THE 2022 RUSSIAN INVASION OF UKRAINE AND MONETARY POLICY RECOMMENDATIONS

Dependent variable: Monetary policy intervention of ECB				
	(I) Immediate action	(II) Interest rate	(III) TLTROs	(IV) Quant. Easing
Treatment (1 = Post-invasion)	-0.282***	-0.006	-0.151	-0.062
	(0.091)	(0.091)	(0.095)	(0.081)
Observations (# professors)	123	117	117	116
R-Squared	0.091	0.020	0.020	0.006
Survey Time	No	No	No	No
Biographic Characteristics	No	No	No	No
Day Fixed Effects	No	No	No	No

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on monetary policy recommendations of tenured economics university professors in Germany. The dependent variable in Column (I) is a dummy variable measuring whether respondents believe that the ECB should take immediate action to bring down inflation. The dependent variables in the subsequent columns are dummy variables for individual policy measures, including an increase in the main refinancing rate for open market operations (Column II), terminate the renewal of Targeted Longer-Term Refinancing Operations (TLTROs) (Column III), and stop or reduce Quantitative Easing programs of the ECB (Column IV). The model specifications replicate the parsimonious model underlying Column (I) of Table (1). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

*** Significant at the 1 percent level

regarding economic policy.

The standard textbook policy measure to tackle rising inflation rates during economic booms would be implementing restrictive monetary policies. However, while such policies are suitable to bring down demand-side driven price increases in phases of economic expansion, they have adverse effects when price increases are driven by a reduction in aggregate supply. From the answers given to questions eliciting participants' perceived causes of inflation, we know that the respondents in our sample believe that price increases at the time of the survey have been mainly supply-side driven and that the Russian invasion in Ukraine has intensified the problem of supply shortages (see section 5.4). Hence, our hypothesis is that participants who received the treatment are more hesitant to demand immediate action of the ECB, which may likely put additional pressure on the supply side.

To examine the impact of the treatment on policy recommendations, we re-estimate the benchmark parsimonious model specification using respondents' advise regarding

immediate policy intervention of the ECB as the dependent variable. The results are shown in Table (2). Consistent with our hypothesis, we observe that academic experts in the treatment group are 28% less likely to recommend immediate policy action of the ECB. This effect is statistically significant at the 1% level ($t = 3.11$). We also find negative treatment effects for all individual policy measures queried in our survey, including an increase in main refinancing rates for open market operations (Column II), a termination of the renewal of Targeted Longer-Term Refinancing Operations (TL-TROs) (Column III), and a termination or reduction of Quantitative Easing programs of the ECB (Column IV).[7] The effects are, however, not statistically significant at the 10% level.

6 Conclusion

Expectations about the future are a key determinant of all forward-looking decisions, and hence exert a powerful influence on aggregate economic outcomes. In this paper, we examine the impact of the 2022 Russian invasion of Ukraine on the short- and long-run inflation expectations of economics professors at German universities and on their views on optimal monetary policy. In a unique data set, we compare expectations and policy recommendations prior to and after the invasion for a homogeneous sample. Given that the exact timing and scope of the invasion was impossible to forecast, this allows us to treat the exogenous political shock as a natural experiment.

The main message of our study is that incisive events like political shocks can have immediate effects on agents' macroeconomic expectations about the future. The economics experts in our sample increase short-run inflation expectations for 2022 by about 0.75 percentage points after the Russian invasion of Ukraine. Moreover, the adjustment in inflation expectations is accompanied by a change in their monetary policy recommendations. In line with the interpretation of the shock as causing a supply-side driven inflation surge, after the invasion of Ukraine significantly fewer experts recommend immediate action of the ECB to reduce inflation.

Overall, our study shows that global political shocks may well have implications for the macroeconomic outlook, which are immediately reflected in experts' expectations.

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[7]At the time of our survey, the main refinancing rate for open market operations was 0.00%, the deposit facility rate was negative at -0.50%. In addition, the ECB launched the "Pandemic Emergency Purchase Programme" (PEPP) in March 2020 with the goal to purchase bonds to the value of 750 billion Euro.

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Supplementary Material A: Additional Tables

Table A-1 BALANCE TESTS—SAMPLE MEANS OF CONTROL AND TREATMENT GROUP AND T-TESTS FOR DIFFERENCES IN MEAN CHARACTERISTICS

(I) **Variable**	(II) **Control (mean)**	(III) **Treatment (mean)**	(IV) **Difference (t)**
Gender (1 = female)	0.129	0.114	0.0151 (0.25)
Academic age (coded in year of PhD)	1997.18	1998.79	-1.610 (0.83)
Field of study (1 = Macroeconomist)	0.188	0.134	0.052 (0.75)
Location affiliation: East (1 = yes)	0.138	0.136	0.002 (0.35)
Location PhD: East (1 = yes)	0.051	0.045	0.006 (0.15)
Time used for survey (in seconds)	1287.28	1918.71	-631.42 (0.37)

Notes: The table reports the mean levels of key biographic, geographic and bibliographic characteristics of participants included in our sample for the control group (Column II) and the treatment group (Column III). The differences between the means are reported in Column IV, with test statistics of a two-sample t-test reported in parentheses. To guarantee anonymity of participants, we do not ask respondents for socio-economic characteristics directly in our survey.

Table A-2 THE 2022 RUSSIAN INVASION OF UKRAINE AND SHORT-RUN INFLA-
TION EXPECTATIONS—BASELINE-RESULTS, COMMON SAMPLE

Dependent variables: Inflation expectations for the year 2022

	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	0.673***	0.697***	0.706***	0.969**
	(0.202)	(0.212)	(0.217)	(0.465)
Observations (# professors)	131	131	131	131
R-Squared	0.092	0.094	0.100	0.118
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on inflation expectations of tenured economics university professors in Germany. The table reports results for a unified sample of participants. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

***   Significant at the 1 percent level,
 **   Significant at the 5 percent level

Table A-3 THE 2022 RUSSIAN INVASION OF UKRAINE AND SHORT-RUN INFLA-TION EXPECTATIONS—EXCLUDING PARTICIPANTS SURVEYED AFTER THE ANNOUNCEMENT OF GERMAN ECONOMIC SANCTIONS

Dependent variable: Inflation expectations for the year 2022

	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	0.792***	0.839***	0.839***	1.037**
	(0.289)	(0.303)	(0.303)	(0.464)
Observations (# professors)	118	118	118	118
R-Squared	0.056	0.060	0.059	0.062
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on inflation expectations of tenured economics university professors in Germany, excluding participants that are surveyed after the announcement of economic sanctions imposed by Germany. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

   ***   Significant at the 1 percent level,
    **   Significant at the 5 percent level

Table A-4 THE 2022 RUSSIAN INVASION OF UKRAINE AND INFLATION EXPECTATIONS—TREATMENT EFFECTS FOR MEDIUM-TERM AND LONG-TERM EXPECTATIONS

Dependent variables: Inflation expectations for the years 2022 and 2026

	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
	Panel A: Medium-term inflation expectations for the year 2023			
Treatment (1 = Post-invasion)	0.468*	0.471*	0.413*	0.283
	(0.248)	(0.254)	(0.243)	(0.347)
Observations (# professors)	130	130	123	123
R-Squared	0.021	0.021	0.046	0.054
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes
	Panel B: Long-term inflation expectations for the year 2026			
Treatment (1 = Post-invasion)	0.162	0.194	0.318	0.379
	(0.259)	(0.267)	(0.273)	(0.344)
Observations (# professors)	107	107	102	102
R-Squared	0.004	0.010	0.120	0.143
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on inflation expectations of tenured economics university professors in Germany. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

* Significant at the 10 percent level

Table A-5 THE 2022 RUSSIAN INVASION OF UKRAINE AND INFLATION EXPECTATIONS—EFFECT HETEROGENEITY

Dependent variables: Inflation expectations for the year 2022

Specification	Coefficient	(SE) p-val.	R-squared	N
1. By gender				
Treatment_i	0.792***	(0.241)	0.076	138
$\text{Treatment}_i \times \text{Gender}_i$	-0.226	(0.585)		
p-value on Wald test of equal parameters		0.859		
2. By field				
Treatment_i	0.732***	(0.218)	0.081	138
$\text{Treatment}_i \times \text{Macroeconomist}_i$	0.099	(0.743)		
p-value on Wald test of equal parameters		0.940		
3. By academic age				
Treatment_i	0.752**	(0.427)	0.073	138
$\text{Treatment}_i \times \text{Academic Age}_i$	0.005	(0.164)		
p-value on Wald test of equal parameters		0.994		
4. By geographic location of affiliation				
Treatment_i	0.578***	(0.217)	0.112	138
$\text{Treatment}_i \times \text{East Location}_i$	1.214	(0.776)		
p-value on Wald test of equal parameters		0.432		
5. By place of PhD				
Treatment_i	0.654***	(0.207)	0.147	135
$\text{Treatment}_i \times \text{East PhD}_i$	-1.926	(1.70)		
p-value on Wald test of equal parameters		0.611		

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on inflation expectations of tenured economics university professors in Germany, accounting for treatment heterogeneity. Results are obtained using the parsimonious model specifications of Column (I) of Table (1), including interaction terms between the treatment variable and individual-level characteristics of participants. Each specification includes the treatment variable, the moderator variable and the interaction term; for brevity, we only report the treatment and the interaction term. Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses. The row entitle "*p-value on Wald test of equal parameters*" reports the p-value for a test of equality between the baseline estimates of Column (I) of Table (1) and the parameter estimates of the individual Row. "Gender" is a dummy variable that is 1 for female respondents (zero otherwise), "Macroeconomist" is a dummy variable that is 1 if respondents' field of study includes macroeconomic topics, "Academic Age" measures the decade in which respondents obtained their PhD (from the 1970s to the 2010s), and "East Location" and "East PhD" are dummy variables that are 1 if a respondent is affiliated with a university or a research institute in East Germany or has received the PhD from a university located in East Germany.

***   Significant at the 1 percent level,
**   Significant at the 5 percent level

Table A-6 THE 2022 RUSSIAN INVASION OF UKRAINE AND PERCEIVED CAUSES OF INFLATION—RUSSIAN INVASION OF UKRAINE

Dependent variable: Russian invasion as cause of inflation

	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	0.178**	0.194**	0.180**	0.141
	(0.074)	(0.079)	(0.078)	(0.142)
Observations (# professors)	104	104	99	99
R-Squared	0.076	0.089	0.109	0.275
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on the perceived causes of inflation of tenured economics university professors in Germany. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

** Significant at the 5 percent level

Table A-7 THE 2022 RUSSIAN INVASION OF UKRAINE AND PERCEIVED CAUSES
OF INFLATION—SUPPLY-SIDE EFFECTS

Dependent variable: Supply-side effects as cause of inflation				
	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	-0.0441	-0.0520	-0.0770	0.111
	(0.104)	(0.107)	(0.112)	(0.194)
Observations (# professors)	104	104	99	99
R-Squared	0.002	0.003	0.057	0.108
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion
of Ukraine on the perceived causes of inflation of tenured economics university professors in Ger-
many. The table presents results from four specifications. We start with a parsimonious model that
only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents,
measured via the time (in seconds) participants used to answer the survey (Column II), biographic
characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period
to account for confounding effects in the post-invasion phase (Column IV). Biographic information
includes participants' gender, academic age (measured by the year in which participants obtained their
PhD), the location of participants' affiliation (East versus West), and the location of the affiliation
from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for
arbitrary heteroskedasticity) are reported in parentheses.

Table A-8 THE 2022 RUSSIAN INVASION OF UKRAINE AND PERCEIVED CAUSES OF INFLATION—DEMAND-SIDE EFFECTS

Dependent variable: Demand-side effects as cause of inflation

	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	-0.0490	-0.0433	-0.0460	0.157
	(0.062)	(0.065)	(0.071)	(0.189)
Observations (# professors)	104	104	99	99
R-Squared	0.005	0.007	0.033	0.086
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on the perceived causes of inflation of tenured economics university professors in Germany. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

Table A-9 THE 2022 RUSSIAN INVASION OF UKRAINE AND PERCEIVED CAUSES OF INFLATION—EFFECTS OF THE COVID-19 PANDEMIC

Dependent variable: COVID-19 effects as cause of inflation

	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	-0.0359	-0.0359	-0.0781	0.115
	(0.068)	(0.069)	(0.069)	(0.184)
Observations (# professors)	104	104	99	99
R-Squared	0.003	0.003	0.040	0.106
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on the perceived causes of inflation of tenured economics university professors in Germany. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

Table A-10 THE 2022 RUSSIAN INVASION OF UKRAINE AND PERCEIVED CAUSES OF INFLATION—MONETARY POLICY EFFECTS

Dependent variable: Monetary policy as cause of inflation

	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	0.0278	0.0198	0.0425	0.0478
	(0.092)	(0.094)	(0.101)	(0.196)
Observations (# professors)	104	104	99	99
R-Squared	0.001	0.003	0.007	0.019
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on the perceived causes of inflation of tenured economics university professors in Germany. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

Table A-11 THE 2022 RUSSIAN INVASION OF UKRAINE AND PERCEIVED CAUSES OF INFLATION—EFFECTS OF ENERGY PRICES

Dependent variable: Energy prices as cause of inflation

	(I) Parsimonious	(II) + Effort (time)	(III) + Biography	(IV) + Day-FE
Treatment (1 = Post-invasion)	-0.0435	-0.0682	-0.0717	-0.261
	(0.097)	(0.100)	(0.108)	(0.206)
Observations (# professors)	105	105	100	100
R-Squared	0.00201	0.0161	0.0322	0.0855
Survey Time	No	Yes	Yes	Yes
Biographic Characteristics	No	No	Yes	Yes
Day Fixed Effects	No	No	No	Yes

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on the perceived causes of inflation of tenured economics university professors in Germany. The table presents results from four specifications. We start with a parsimonious model that only accounts for the treatment effect (Column I), and gradually introduce the effort of respondents, measured via the time (in seconds) participants used to answer the survey (Column II), biographic characteristics of respondents (Column III), and fixed effects for each day of the post-treatment period to account for confounding effects in the post-invasion phase (Column IV). Biographic information includes participants' gender, academic age (measured by the year in which participants obtained their PhD), the location of participants' affiliation (East versus West), and the location of the affiliation from which participants obtained their PhD (East versus West). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

Table A-12 THE 2022 RUSSIAN INVASION OF UKRAINE AND SHORT-RUN INFLA-TION EXPECTATIONS—PERCEIVED MECHANISMS UNDERLYING THE TREAT-MENT EFFECTS OF THE INVASION

Dependent variable: Dummy variable (1 = War and other factors)				
	(I) Supply side	(II) Energy price	(III) COVID-19	(IV) Monetary Policy
Treatment (1 = Post-invasion)	0.134** (0.064)	0.104 (0.067)	0.0595 (0.041)	0.0297 (0.030)
Observations (# professors)	104	104	104	104
R-Squared	0.0728	0.0352	0.0412	0.0202
Survey Time	No	No	No	No
Biographic Characteristics	No	No	No	No
Day Fixed Effects	No	No	No	No

Notes: The table shows the results of our estimations on the effect of the 2022 Russian invasion of Ukraine on answers given in free-text entry boxes about the causes of inflation of tenured economics university professors in Germany. In each column, we report results for dummy variables that assume a value of 1 if respondents report in free-text entry that the Russian invasion is a cause of inflation and other causes of inflation. Other causes included supply-side factors, energy prices, the COVID-19 pandemic, and monetary policy. The model specifications replicate the parsimonious model underlying Column (I) of Table (1). Robust standard errors (adjusted for arbitrary heteroskedasticity) are reported in parentheses.

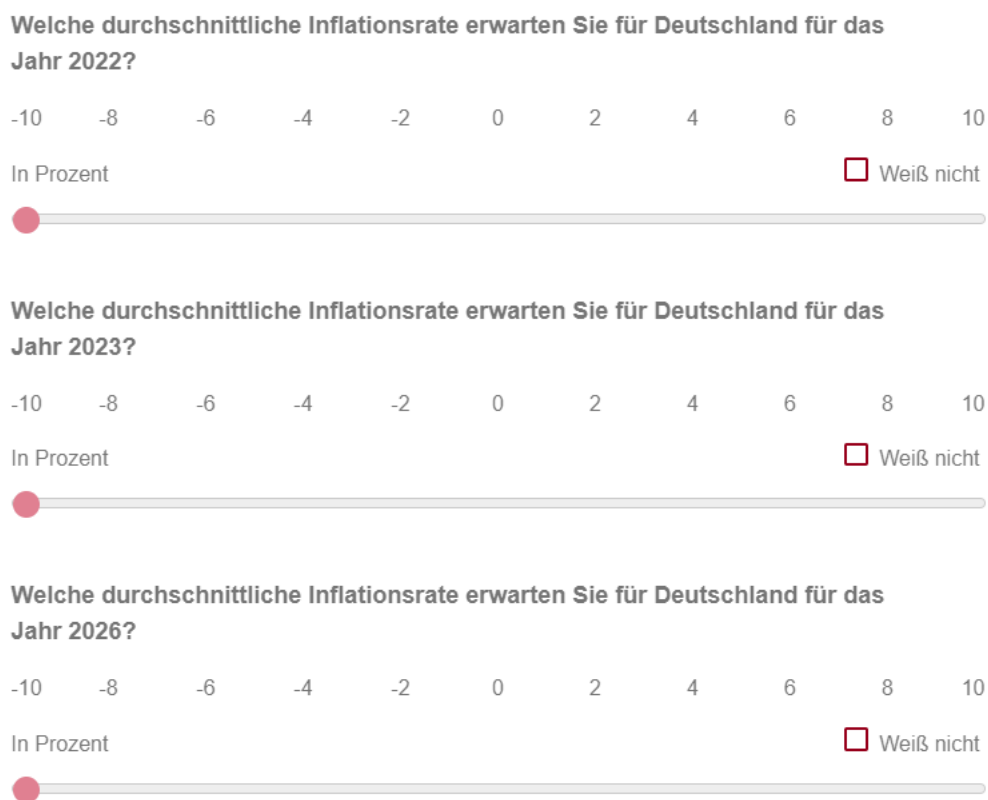** Significant at the 5 percent level

Supplementary Material B: Additional Figures

Figure B-1 ANTICIPATION EFFECTS PRIOR TO THE RUSSIAN INVASION IN UKRAINE
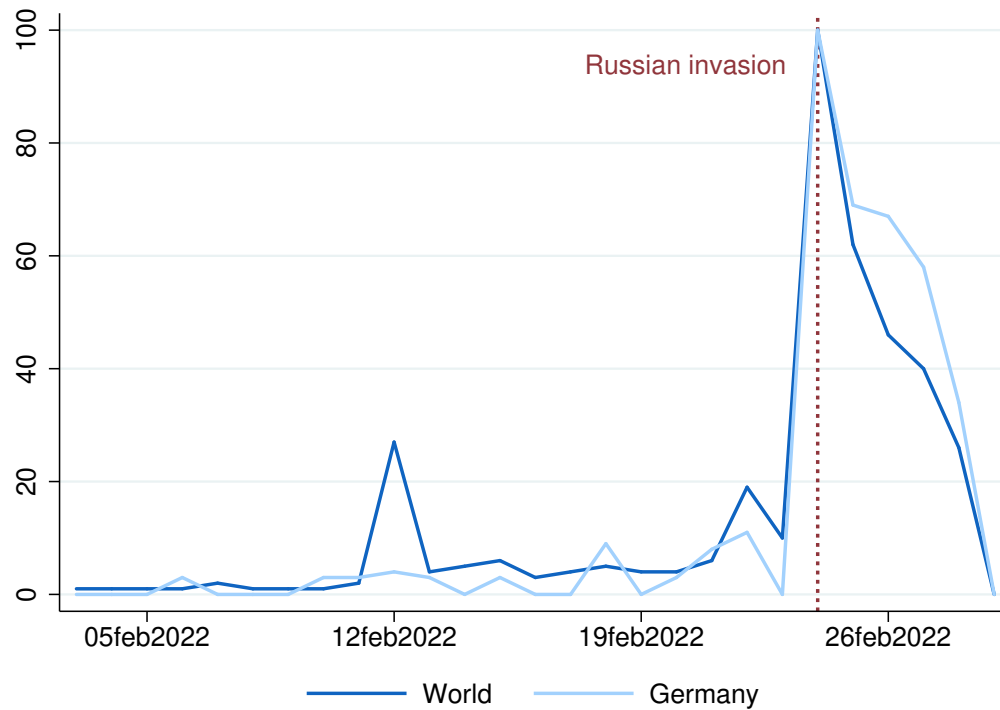
Notes: The figure shows interest scores of Google trends, measures via Google search queries and normalized on a scale between 0 (low interest) and 100 (high interest), of a Russian invasion in the Ukraine. The figures plots interest scores for the world as a whole and for Germany, from where the academic experts of the survey are recruited.).

Figure B-2 THE QUESTIONNAIRE OF THE SURVEY. PART I: QUESTIONS ASKING PARTICIPANTS ABOUT THEIR INFLATION EXPECTATIONS FOR THE YEARS 2022, 2023, AND 2026.

Welche durchschnittliche Inflationsrate erwarten Sie für Deutschland für das Jahr 2022?

| -10 | -8 | -6 | -4 | -2 | 0 | 2 | 4 | 6 | 8 | 10 |

In Prozent ☐ Weiß nicht

Welche durchschnittliche Inflationsrate erwarten Sie für Deutschland für das Jahr 2023?

| -10 | -8 | -6 | -4 | -2 | 0 | 2 | 4 | 6 | 8 | 10 |

In Prozent ☐ Weiß nicht

Welche durchschnittliche Inflationsrate erwarten Sie für Deutschland für das Jahr 2026?

| -10 | -8 | -6 | -4 | -2 | 0 | 2 | 4 | 6 | 8 | 10 |

In Prozent ☐ Weiß nicht

Notes: The figure shows the first part of questions included in our survey that ask participants about their inflation expectations for the years 2022, 2023, and 2026. The figures shows the original wording in German. The English language equivalent is: *"Which average inflation rate do you expect for Germany in the year* [2022, 2023, 2006]*?"*).

Figure B-3 THE QUESTIONNAIRE OF THE SURVEY. PART II: QUESTIONS ASKING PARTICIPANTS ABOUT THE CURRENT CAUSES OF INFLATION.

Was ist/sind Ihrer Meinung nach die wichtigste(n) Ursache(n) für die *aktuelle* Verbraucherpreissteigerung in Deutschland?

Notes: The figure shows the second part of questions included in our survey that ask participants about the current causes of inflation. The figures shows the original wording in German. The English language equivalent is: *"In your opinion, what are the most important reasons for the current increase in consumer prices in Germany?"*).

Figure B-4 THE QUESTIONNAIRE OF THE SURVEY. PART III: QUESTIONS ASKING PARTICIPANTS ABOUT MONETARY POLICY (1/3).

Sollte die **EZB** sofort Maßnahmen ergreifen, um die Inflation zu senken?

Ja, weil

Nein, weil

Weiß nicht

Notes: The figure shows the second part of questions included in our survey that ask participants about monetary policy reactions in response to current rates of inflation. The figures shows the original wording in German. The English language equivalent is: *"Should the ECB take immediate action to bring down inflation?"*).

Figure B-5 THE QUESTIONNAIRE OF THE SURVEY. PART III: QUESTIONS ASKING PARTICIPANTS ABOUT MONETARY POLICY (2/3).

Welche Maßnahmen sollte die **EZB** sofort oder zu einem späteren Zeitpunkt in 2022 ergreifen, um das Ziel der mittelfristigen Preisstabilität zu erreichen?
[Mehrfachnennungen möglich]

Gezielte längerfristige Refinanzierungsgeschäfte (TLTROs) nicht wieder neu auflegen, weil

Leitzinsen erhöhen, weil

Quantitative Lockerung (QE) reduzieren, weil

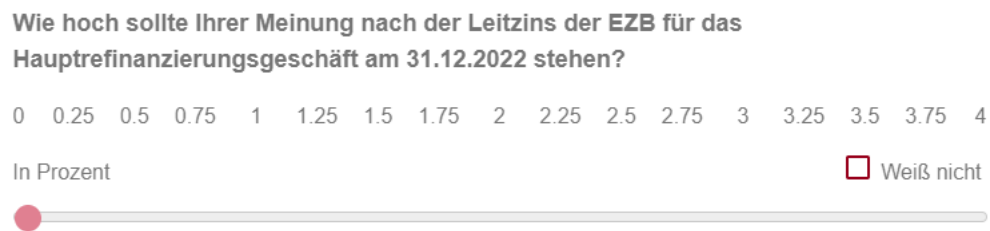Quantitative Lockerung (QE) stoppen, weil

Andere:

Keine, weil

Weiß nicht

Notes: The figure shows the second part of questions included in our survey that ask participants about monetary policy reactions in response to current rates of inflation. The figures shows the original wording in German. The English language equivalent is: *"Which measures should the ECB take, immediately or at a later point in time in 2022, to achieve the goal of medium-term price stability?"*).

Figure B-6 THE QUESTIONNAIRE OF THE SURVEY. PART III: QUESTIONS ASKING PARTICIPANTS ABOUT MONETARY POLICY (3/3).

Notes: The figure shows the second part of questions included in our survey that ask participants about monetary policy reactions in response to current rates of inflation. The figures shows the original wording in German. The English language equivalent is: *"How high do you think the key ECB interest rate for the main refinancing operation should be on December 31, 2022?"*).

Figure B-7 WORD CLOUD ILLUSTRATING THE WORDS USED IN OPEN-ENDED QUESTION Q4 REGARDING PARTICIPANTS' PERCEIVED CAUSES OF INFLATION.

(a) Control group.   **(b)** Treatment group.

Word	# of Ans.	% of Ans.
Energiepreise (*Energy prices*)	22	0.324
Lieferengpass (*Shortage of supply*)	13	0.191
Geldpolitik (*Monetary policy*)	11	0.162
Lieferkette (*Supply chain*)	10	0.147
Energie (*Energy*)	9	0.132
EZB (*ECB*)	6	0.088
Rohstoffpreise (*Commodity prices*)	5	0.074

Word	# of Ans.	% of Ans.
Energiepreise (*Energy prices*)	14	0.389
Ukraine, Russland (*Ukraine, Russia*)	8	0.222
Krieg (*War*)	6	0.167
EZB (*ECB*)	6	0.167
Geldpolitik (*Monetary policy*)	6	0.167
Energie (*Energy*)	4	0.111
Lieferengpass (*Shortage of supply*)	3	0.083

Notes: The figure visualizes the words used to answers the open-ended question in our survey (Q4), asking participants about their assessment of the causes of inflation in Germany. Answers are pre-processed to eliminate stopwords. Word clouds are shown separately for the subsample of respondents in the control group (panel on the left-hand side) and the subsample of respondents in the treatment group (panel on the right-hand side). The tables below the word cloud list the top words used by participants, their absolute (column labeled "# of Ans.") and relative (column labeled "% of Ans.") frequency, and an English language equivalent (in parentheses).