Impact of the Ukraine War on Gas Price Expectations: New Survey Evidence from Chinese Households *

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Abstract

We conduct a survey of 2,500 Chinese households to study their formation of gas price expectations following the 2022 Ukraine war. Respondents provided their priors about recent and future gas price inflation. Participants were randomly exposed to information about recent gas price inflation, and some were primed to think about the Ukraine war. We then re-solicited gas price expectations, and asked respondents about their spending plans and for open-ended explanations of their responses. Both information treatments increase respondents' gas price inflation expectations by about 3 percentage points, and reduce their expectations of purchasing any of the durable goods by about 2 percentage points. However, there is not a significant difference between the post-treatment expectations of the respondents in the two treatment groups, suggesting that respondents were already aware that the Ukraine war was responsible for some of the rise in gas prices. Text analysis of households' open-ended responses reveals that households' first-order reactions center around oil and energy, followed closely by concerns about the price.

JEL classification: E31, E71, D83

Keywords: China, Gas Prices, Inflation, Narratives, Text Analysis, War

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1 Introduction

Major geopolitical shocks, like the Russian invasion of Ukraine in 2022, can affect the global economy through many different channels. In particular, these large shocks can affect the expectations and sentiment of market participants and consumers, in turn affecting their investment and consumption. We focus in this paper on the gas price expectations of Chinese consumers, who are likely to be highly affected by the war due to China's trade relations with both Russia and Ukraine. Namely, China is a major importer of oil and gas from Russia[1], and of corn from Ukraine.[2]

Understanding Chinese consumers' expectations is important given China's large and growing share of global GDP and consumption. Yet there is very limited literature on their expectations, mostly due to limited data availability. To learn more about how Chinese consumers form their expectations, how they incorporate the Russian invasion into their expectations, and how their expectations affect their consumption plans, we conducted a survey of 2,500 consumers in four major Chinese cities. We asked respondents about their perceptions of gas price inflation and overall inflation over the past 12 months, and their expectations of gas price inflation and overall inflation over the next 12 months.

We then randomly assigned respondents to three groups. The control group received no information. One treatment group was told that "The price of gasoline in China went up by 34% over the last 12 months." The other treatment group was told that "The price of gasoline in China went up by 34% over the last 12 months. Part of this increase followed the Ukraine war." The difference between the first and second treatment is intended to test whether priming respondents to think about the Russian invasion changes their interpretation of the economic information that we provide. We then re-solicited consumers' gas price expectations in the form of a density forecast, and asked about their planned major purchases in the next 12 months.

Note that the statistical information we provided was publicly available information. Thus, consumers could have already incorporated this information into their pre-treatment expectations, in which case the treatment would have no effect on post-treatment expectations. However, many other surveys have shown that U.S. consumers update their expectations in response to treatment

[1] China is the largest oil importer of the world, and the largest purchaser of Russian crude oil. Chen Aizhu and Florence Tan, April 6, 2022, Reuters, accessed at https://www.reuters.com/business/energy/exclusive-china-state-refiners-shun-new-russian-oil-trades-teapots-fly-under-2022-04-06/.

[2] In 2021, 29% of China's corn imports came from Ukraine.

with publicly available information, indicating departures from full-information rational expectations (Binder and Rodrigue, 2018). This is the case in our survey too, as respondents in both treatment groups have significantly higher post-treatment expectations than the control group. However, there is not a significant difference between the post-treatment expectations of the respondents in the two treatment groups, suggesting that respondents were already aware that the Russian invasion was responsible for some of the rise in gas prices.

This is one of the first studies, to our knowledge, on the impact of the war in Ukraine on expected gas prices and inflation expectations. One other paper on this topic is by Dräger et al. (2022), who survey 145 tenured economics professors in Germany and find that the Russian invasion increased inflation expectations by about 0.75 percentage points. Our paper differs from theirs in that we focus on Chinese households, rather than German professors. Expectations formation of the general public can differ notably from that of experts, and this may also be the case in this context (Carroll, 2003). We have a larger sample, and we focus on expectations of gas price inflation in addition to overall price inflation.

Our focus on gas price perceptions and expectations is motivated by a large literature on the impact of oil and gas prices on the macroeconomy (Hamilton, 1996; Baumeister and Kilian, 2016a,b; Zhang, 2022), and more specifically on actual and expected inflation (Coibion and Gorodnichenko, 2015; Binder, 2018; Choi et al., 2018). For example, Chen (2009) finds that the oil price pass-through to inflation has declined over time in a sample of 19 industrialized countries. Klepacz (2021) finds that increased oil price volatility leads to increased price change dispersion and no associated change in price change frequency.

We note that the regulatory environment in China may alter the pass-through from oil prices to gasoline prices, which are set jointly by the National Development and Reform Commission (NDRC) and the market . Around twice a month, the NDRC adjusts the price ceiling of domestic refined oil products based on international oil prices and releases the relevant price information to the market. Retailers can set prices under the price ceiling based on local market conditions. Despite these pricing regulations, gas prices do fluctuate substantially, as shown in Figure 1.

Our work is also related to a broader literature that studies the causal impact of public information on inflation expectations using natural experiments (Carrillo and Emran, 2012) or randomized control trials (Armantier et al., 2016; Binder, 2021). Some of these studies have focused on the

effects of crises or disasters on expectations (Baker et al., 2020; Armantier et al., 2021; Binder, 2020).

Figure 1: Gasoline Price Inflation in China

Notes: This figure shows the gasoline price inflation in China, measured as percentage change from 12 months ago. The mean and standard deviation are 1.8 and 14.0, respectively. The persistent parameter estimated from an AR(1) process is 0.94. Gasoline price data are retrieved from the National Development and Reform Commission.

Finally, we also contribute to a growing literature on narratives in economics (Shiller, 2017; Andre et al., 2021; Ferrario and Stantcheva, 2022). We collect novel data on households' main considerations regarding the impact of the war on China's economy. Thus, households' responses to this open-ended question provide meaningful insights into what really matters for them and justify our study on the impact of the war on energy price inflation.

The rest of the paper proceeds as follows. Section 2 describes the Chinese household survey. Section 3 presents households' beliefs regarding gasoline price inflation. Section 4 uses randomized controlled trials to explore the causal impact of public information on households' expectation and consumption. Section 5 elicits households' first-order concerns by analyzing open-ended survey questions. Section 6 concludes. Additional tables and figures are relegated to the appendix.

2 Survey Design and Sample

The survey was conducted by DATA100, a market research company that specializes in online survey studies. Questionnaires were distributed using cell phone applications to residents aged 15 years old and above, and a total number of 2,500 surveys were collected according to demographic features (gender, age, education, employment, and car ownership) in Beijing, Shanghai, Guangzhou, and Shenzhen. These are the four "first-tier" cities, and they account for 6.9% of the total population and 12.5% of GDP in China.

Table 1 provides summary statistics of our respondents' demographics compared to the actual demographics of the four cities. Our sample is highly representative of the cities' population in terms of age, sex, education, car ownership, employment status, and income. A limitation of our survey is that we do not sample from the rural population, who may have very different exposure to gas prices than urban consumers.

Table 1: Demographics by City

	Beijing		Shanghai		Guangzhou		Shenzhen	
Demographics	Actual	Survey	Actual	Survey	Actual	Survey	Actual	Survey
15-59					86.7	86.8	93.7	93.7
15-29	20.2	20.1	19.7	19.8				
30-44	32.4	32.4	30.8	30.7				
45-59	25.1	25.2	23.5	23.6				
>60	22.3	22.3	26.0	25.9	13.3	13.2	6.3	6.3
Female	48.8	48.8	48.3	48.1	47.2	47.3	45.0	45.1
Middle sch. or below	32.4	32.6	41.3	43.6	42.7	42.9	41.6	44.0
High school	20.0	19.8	21.2	20.3	25.6	25.5	24.4	23.5
College or above	47.6	47.6	37.5	36.1	31.7	31.6	34.0	32.5
Car ownership	35.8	35.0	19.8	21.0	18.6	19.0	25.4	24.0
Private + Self emp.	61.5	62.0	69.5	71.0	46.0	47.1	52.6	53.4
Ave. mon. inc. (k)	15.3	17.1	14.5	17.2	12.5	14.5	14.5	16.1
Num of respondents	660		770		550		520	

Notes: This table compares the demographics in the survey with actual. The actual values are retrieved from Beijing Statistical Yearbook 2021 (link), Shanghai Statistical Yearbook 2021 (link), Guangzhou Statistical Yearbook 2021 (link), and Shenzhen Statistical Yearbook 2021 (link). The actual detailed age distribution is not available for Guangzhou and Shenzhen. Car ownership is calculated as the ratio of registered vehicles to population in each city. The statistics in employment is based on the 2019 values.

The survey was conducted in Chinese, and the Chinese version of the survey questions are in the appendix. Here we provide English translations. First, respondents' priors about overall and gas price inflation are solicited. We instruct respondents, "If you think values have gone up, please

provide positive values for percent changes. If you think values have gone down, please provide negative values for percent changes." Then we ask:

- Over the **past** 12 months, by what percentage do you think overall prices in the economy has changed?
- Over the **past** 12 months, by what percentage do you think the price of gasoline has changed?
- Over the **next** 12 months, by what percentage do you think overall prices in the economy will change?
- Over the **next** 12 months, by what percentage do you think the price of gasoline will change?

Next, we randomly assign respondents to three equally-sized groups. The control group (Group 1) procedes directly to the follow-up questions. The treatment groups (Groups 2 and 3) receive the following information:

- **Group 2:** "The price of gasoline in China went up by 34% over the last 12 months."
- **Group 3:** "The price of gasoline in China went up by 34% over the last 12 months. Part of this increase followed the Ukraine war."

To solicit post-treatment expectations, we ask for respondents' density forecasts, to avoid confusing them by repeating the same question. We first ask, "What do you think are low, medium and high possible changes in gasoline price for China over the next twelve months? If you think values will go up, please provide positive values for percent changes. If you think values will go down, please provide negative values for percent changes." We then ask, "What do you think is the probability that the change in gasoline price over the next twelve months ends up at the low, medium and high levels that you just picked? These probabilities should sum to 100%." Respondents provide three probabilities.

Next, we ask about planned consumption: "In the next 12 months, which of the following do you plan to purchase? (Select all that apply.)" Options include a house, a car, a computer, a cellphone, and none of the above.

3 Expectations and Perceptions

Table 2 summarizes beliefs about gas price inflation in the pre- and post-treatment periods, by city. As shown in Panel A, the mean respondent believes that gas prices have increased by 22% in the past 12 months, and expects gas prices to increase by 18.4% in the next 12 months. These aggregate perceptions and expectations are very similar across cities, though there is substantial cross-sectional variation (disagreement). This cross-sectional variation can be seen more clearly in Figure 2.

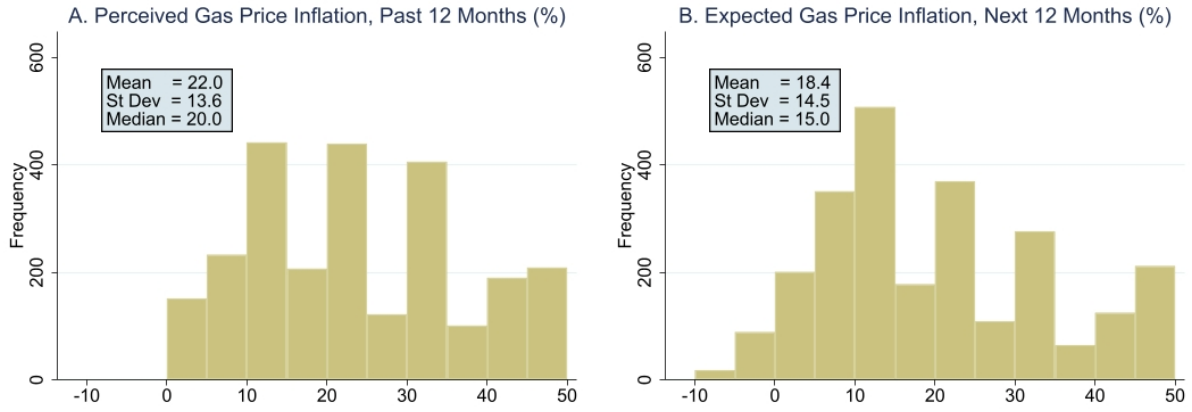
Table 2: Summary Statistics: Gasoline Price Inflation Perceptions and Expectations

	All	Beijing	Shanghai	Guangzhou	Shenzhen
Panel A. Pre Information Treatment					
Perceived, past 12 mths	22.0	21.4	22.1	22.4	22.3
	(13.6)	(13.6)	(13.6)	(13.6)	(13.6)
Expected, next 12 mths	18.4	17.0	18.8	18.7	19.1
	(14.5)	(14.3)	(14.4)	(14.8)	(14.5)
Panel B. Post Information Treatment: Mean of Density Forecasts					
Control Group	21.9	20.6	21.0	23.0	23.5
	(17.0)	(17.4)	(16.5)	(16.4)	(17.2)
Info Treatment Group 1	24.5	23.1	25.4	25.0	24.4
	(15.4)	(16.0)	(14.9)	(14.9)	(16.5)
Info Treatment Group 2	24.5	25.1	23.0	26.3	23.1
	(15.7)	(15.3)	(15.5)	(16.0)	(15.8)
Panel C. Post Information Treatment: Uncertainty of Density Forecasts					
Control Group	5.9	5.7	5.5	6.0	6.3
	(4.0)	(4.1)	(3.6)	(4.5)	(4.2)
Info Treatment Group 1	6.1	5.9	6.0	6.1	6.7
	(3.7)	(3.8)	(3.6)	(3.5)	(4.0)
Info Treatment Group 2	6.1	6.2	5.8	6.5	6.0
	(3.5)	(3.5)	(3.2)	(3.8)	(3.6)

Notes: This table shows summary statistics of the pre- and post-information treatment gasoline price inflation perceptions and expectations. Data sets have been winsorized at the 5th and 95th percentile. Panel A is based on the survey questions regarding gasoline price inflation perceptions and expectations before the information treatment. Panel B reports the results from the survey question regarding gasoline price inflation expectations after the information treatment. Panel C presents the results on the second moment - uncertainty - of gasoline price inflation expectations after the information treatment. Info treatment group 1 is informed "*The price of gasoline in China went up by 34% over the last 12 months.*"; Info Treatment Group 2 is further informed that "*[...] Part of this increase followed the Ukraine war.*" Standard deviation across responses are reported in the parenthesis.

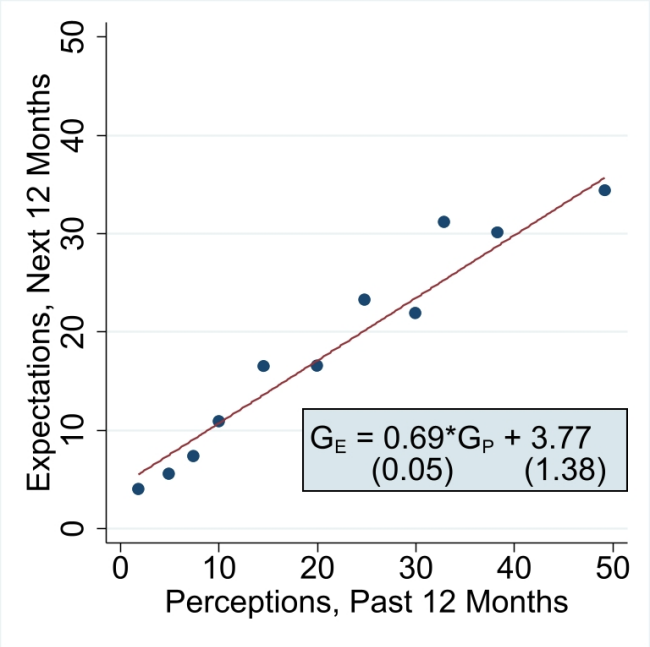
Panel B shows that after the information treatments, both treatment groups have slightly higher gas price inflation expectations than the control group, and slightly lower disagreement. Recall that the information treatment informed respondents that gas price inflation had been 34%, which was

Figure 2: Histograms of Perceived and Expected Gas Price Inflation



Notes: This figure shows histograms of perceived inflation over the past 12 months and expected inflation over the next 12 months for gasoline prices. Data has been winsorized at the 5th and 95th percentile.

Figure 3: Scatter Plots of Gasoline Price Expectations and Perceptions



Notes: This figure shows binned scatter plots of gas price inflation expectations and perceptions. Data has been winsorized at the 5th and 95th percentile.

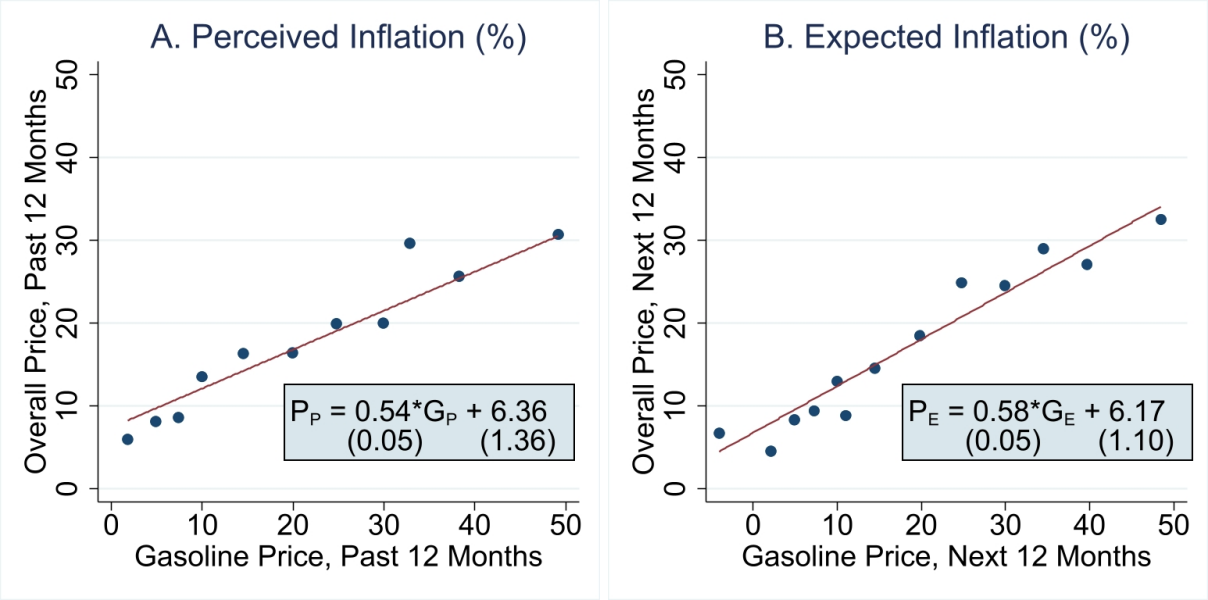
higher than the average prior, so respondents in the treatment group seem to have updated their beliefs in the direction of the treatment. Finally, Panel C shows that respondents' post-treatment uncertainty, as measured by the standard deviation of their density forecasts, is similar across

treatment and control groups. Section 4 will use regression analysis to formally test for effects of the information treatments.

Figure 3 shows that respondents' expectations and perceptions of gas price inflation are highly correlated, while Figure 4 shows that beliefs about overall and gas price inflation are highly correlated. As further demonstrated in Table A.1 in the appendix, both gas price inflation perceptions and expectations pass through into overall inflation expectations in the next 12 months, even after controlling for perceived overall inflation for the last 12 months.

In the United States, it is well-documented that consumer inflation expectations vary with demographic characteristics (Bryan and Venkatu, 2001). Appendix Table A.2 shows results of regressions of gas price and overall inflation perceptions and expectations on demographic characteristics for the Chinese consumers. Perceptions and expectations of both overall and gas price inflation are lower for consumers over 30 years old than for younger consumers, and, like in the United States, are also lower for consumers with a college education. Interestingly, there is no statistically significant difference in expectations or perceptions by gender. This is in contrast to the United States, where females typically have significantly higher inflation expectations.

Figure 4: Scatter Plots of Overall and Gasoline Price Inflation



Notes: This figure shows binned scatter plots of overall and gasoline price inflation perceptions (Panel A) and expectations (Panel B). Data has been winsorized at the 5th and 95th percentile.

4 Randomized Controlled Trials

In this section, we use regression analysis to test the effects of the information treatments on expectations and consumption. Our first regression specification takes the form:

$$PostExp_i = \beta_1 Treat1_i + \beta_2 Treat2_i + \alpha Prior_i + \boldsymbol{\gamma Z_i} + \varepsilon_i, \tag{1}$$

where $PostExp_i$ is the nonparametric mean or standard deviation of posterior gas price inflation expectations for respondent i, and $Prior_i$ is the respondent's prior. $Treat1_i$ is the binary indicator of information treatment group that is informed "*The price of gasoline in China went up by 34% over the last 12 months.*"; and $Treat2_i$ is the binary indicator of information treatment group that is further informed that "*[...] Part of this increase followed the Ukraine war.*" $\boldsymbol{Z_i}$ denotes a vector of control variables including city fixed effects, and ε_i is the error term.

Results of these regressions are in Table 3. The first column shows that respondents in either treatment group have gas price inflation expectations about 3 percentage points higher than in the control group. The third column shows that respondents in both treatment groups also have *higher* uncertainty than respondents in the control group. The latter finding can be rationalized in the learning model of Baker et al. (2020) in which large shocks affect expectation formation through two channels: attention effect – the visibly large shocks induce immediate and synchronized updating of information for inattentive agents, and uncertainty effect – attentive agents increase their acquisition of private information to compensate for the higher uncertainty after shocks.

The second column of Table 3 shows results from similar regressions with a modified specification. In particular, the regressions include interactions of the treatment dummies with the priors, following Coibion et al. (2020). With this specification, a more negative coefficient on the interaction term indicates higher credibility of the information treatments, as it means that the weight on the prior is smaller. As before, we find that the information treatments increase respondents' gasoline price inflation expectations, and both information treatments are viewed as similarly credible.

Table 3: Post-information-treatment Gasoline Price Inflation Expectation and Uncertainty

	(1)	(2)	(3)
	Mean Expectation		Uncertainty
Info Treat 1	3.02***	8.49***	0.34*
	(0.46)	(0.57)	(0.13)
Info Treat 2	2.80***	6.58***	0.31**
	(0.38)	(0.92)	(0.07)
Prior expectation	0.67***	0.84***	0.08***
	(0.03)	(0.01)	(0.01)
Info Treat 1 * Prior		-0.30***	
		(0.05)	
Info Treat 2 * Prior		-0.20**	
		(0.04)	
Age 30-44	-0.50	-0.41	-0.12
	(1.06)	(1.16)	(0.06)
Age 45-59	0.11	0.22	0.14
	(0.55)	(0.45)	(0.23)
Age 60 or above	-0.61**	-0.71	0.29
	(0.17)	(0.45)	(0.19)
Female	0.94	0.93	-0.10
	(0.90)	(0.92)	(0.08)
Middle sch. or below	-0.15	-0.22	-0.26
	(0.82)	(0.67)	(0.19)
High school	0.01	-0.09	-0.12
	(1.04)	(0.98)	(0.22)
Emp public	-2.46**	-2.51**	-0.25*
	(0.63)	(0.70)	(0.08)
Emp private	-2.11*	-2.05*	-0.29
	(0.78)	(0.76)	(0.13)
Emp others	-1.09	-1.08	-0.10
	(0.55)	(0.64)	(0.31)
Car ownership	0.07	-0.03	0.07
	(0.25)	(0.30)	(0.14)
Low income	-0.19	-0.16	0.01
	(0.67)	(0.67)	(0.20)
Obs	2,500	2,500	2,500
R-sq	0.81	0.81	0.75

Notes: The dependent variables are consumer's mean and uncertainty in post-information-treatment expectation of the gasoline price inflation over the next twelve months. They are calculated nonparametrically based on the probability forecasts, including the low, medium, and high possible gasoline price inflations and associated probability of each case. The key variables of interest are the binary variables for the two information treatment groups. Treatment group 1 is informed that "*The price of gasoline in China went up by 34% over the last 12 months.*" Treatment group 2 is further informed that "*[...] Part of this increase followed the Ukraine war.*" The control group receives no additional information. The other key variable of interest is the pre-information-treatment gasoline price inflation expectation over the next twelve months. City fixed effects are controlled. Different sets of demographics are controlled. Data sets have been winsorized at the 5th and 95th percentile. Robust standard errors clustered at the city level are in parentheses. *, ** and *** denote statistically significant at 10%, 5%, and 1% level, respectively.

Table 4: Post-information-treatment Purchase Decisions

	(1) Apartment	(2) Car	(3) Computer	(4) Cell	(5) Any
Info Treat 1	-0.023**	0.021	0.028***	0.005	-0.024***
	(0.011)	(0.016)	(0.010)	(0.013)	(0.008)
Info Treat 2	-0.018	-0.003	0.019	-0.007	-0.020**
	(0.013)	(0.022)	(0.019)	(0.016)	(0.010)
Age 30-44	-0.022	0.107***	0.024	0.169***	0.037***
	(0.017)	(0.033)	(0.027)	(0.045)	(0.013)
Age 45-59	-0.114***	0.035	-0.016	0.076	-0.010
	(0.027)	(0.048)	(0.052)	(0.065)	(0.034)
Age 60 or above	-0.082***	0.058*	-0.001	0.168***	0.043**
	(0.026)	(0.034)	(0.046)	(0.059)	(0.020)
Female	0.035*	0.032***	-0.001	-0.021	0.027*
	(0.020)	(0.010)	(0.016)	(0.029)	(0.016)
Middle sch. or below	-0.024	0.051	-0.055***	-0.101***	-0.060***
	(0.047)	(0.069)	(0.017)	(0.037)	(0.013)
High school	-0.049	-0.009	-0.085***	-0.128***	-0.084***
	(0.031)	(0.056)	(0.030)	(0.025)	(0.008)
Emp public	-0.044***	0.093*	0.023	0.082***	0.056**
	(0.011)	(0.053)	(0.042)	(0.028)	(0.024)
Emp private	-0.077**	0.068	0.021	0.127***	0.048
	(0.034)	(0.057)	(0.029)	(0.018)	(0.032)
Emp others	-0.112***	-0.035	-0.024	0.040*	-0.021
	(0.040)	(0.067)	(0.033)	(0.024)	(0.036)
Car	0.043***	0.073***	0.046*	0.056**	0.069***
	(0.012)	(0.023)	(0.025)	(0.023)	(0.023)
Low Income	-0.135***	-0.081***	-0.038*	0.017	-0.002
	(0.018)	(0.008)	(0.020)	(0.040)	(0.028)
Obs	2,500	2,500	2,500	2,500	2,500

Notes: In the Probit model, the dependent variable is a binary indicator of whether the consumer plans to purchase the durable good indicated by the column title. The key variables of interest are the binary variables for the two information treatment groups. Treatment group 1 is informed that "*The price of gasoline in China went up by 34% over the last 12 months.*" Treatment group 2 is further informed that "*[...] Part of this increase followed the Ukraine war.*" The control group receives no additional information. Data sets have been winsorized at the 5th and 95th percentile. City fixed effects are controlled. Coefficients indicate the marginal effects at the mean value of each variable. Robust standard errors clustered at the city level are in parentheses. *, ** and *** denote statistically significant at 10%, 5%, and 1% level, respectively.

To test the effect of the information treatments on respondents' consumption plans, we use the regression specification from equation (1), but the dependent variable is a dummy variable that equals one if the consumer plans to purchase certain durable good, and zero otherwise. The results in Table 4 indicate that both information treatments reduce respondents' expectations of purchasing any of the durable goods by about two percentage points. This makes sense because

higher expected future gas prices imply lower expected disposable income, which should reduce expected future consumption (Kilian, 2008). The higher uncertainty induced by the treatments should also reduce respondents' propensity to purchase large durables.

5 Impact of the War: Open-Ended Questions

In this section, we take advantage of open-ended questions to elicit households' first-order considerations when thinking about the war. Specifically, towards the end of the questionnaire, we add the following three questions: "When you think about the Ukraine war, what are the main considerations that come to your mind regarding the impact of the war on (1) China's economy, (2) overall prices in China and (3) gasoline prices in China?" The answers to these open-ended questions will tell us what really matters for households without constraining them to a narrow set of answer options.

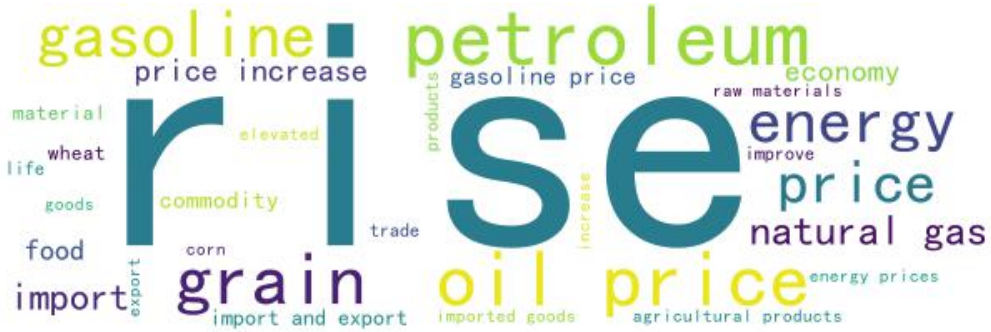
To analyze the responses to these open-ended questions, we employ text analysis methods. We take several steps in pre-processing the data. For households' responses to each question, we split the answer into terms. We drop the stop words, such as "and" and "the," which are common but carry no intrinsic meaning. We further remove the terms mentioned in the survey question itself such as "China" and "economy." Our analyses, including both word clouds and topic analysis, are based on households' original responses in Chinese. We present the results, translated from Chinese into English, in the main text and leave those in Chinese to the appendix (Figure A.1).

As a first step in visualizing the data, in Figure 5, we plot the frequency of the top 30 words derived from the responses. For the impact of the war on China's economy, households' first-order reaction centers around "oil" and "energy," followed closely by concerns about prices. For the impact on overall prices and gasoline prices in China, most households agree on the direction of increase. While word clouds clearly display the font size of a word group proportionally to its frequency, they do not account for synonyms. For example, word clouds fail to assign only slightly different words, e.g. "climb," "rise," "increase," and "elevate," to the same group. Otherwise, the theme of price increase would become more prevalent in our analysis.

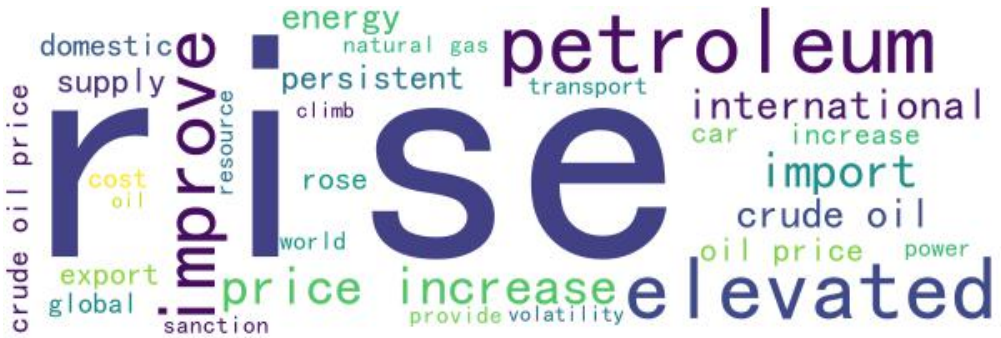
Figure 5: Main Considerations about the Impact of the War

(a) **Impact of the war on China's economy**

(b) **Impact of the war on overall prices in China**



(c) **Impact of the war on gasoline prices in China**



Notes: Word clouds based answers to open-ended questions about respondents' main considerations regarding the impact of the war on (a) China's economy, (b) overall prices in China and (c) gasoline prices in China.

To address the limitation of word clouds, we perform the topic analysis. By carefully reading the survey answers to these open-ended questions, we identify six distinct topics: *Energy*, *Prices*, *Trade*, *Resources (except energy)*, *No Impact* and *Uncertain*. For example, the *Energy* topic contains

"crude oil," "gasoline," and "natural gas." The *Prices* issue is represented by words such as "cost," "increase," "climb," and "elevated." The *Trade* topic contains keywords such as "export," "import," "transport," and "sanction." *Resources (except energy)* include "commodity," "wheat," and "raw materials," among others. The *Uncertain* category is for households who express that they do not know or are not certain about the impact of the war on China's economy or price level. Table A.3 in the appendix lists the full set of keywords, selected according to their frequency distributions, identifying each topic. We count a response as mentioning a topic if the response contains at least one of the topic keywords. A response can thus belong to multiple topics.

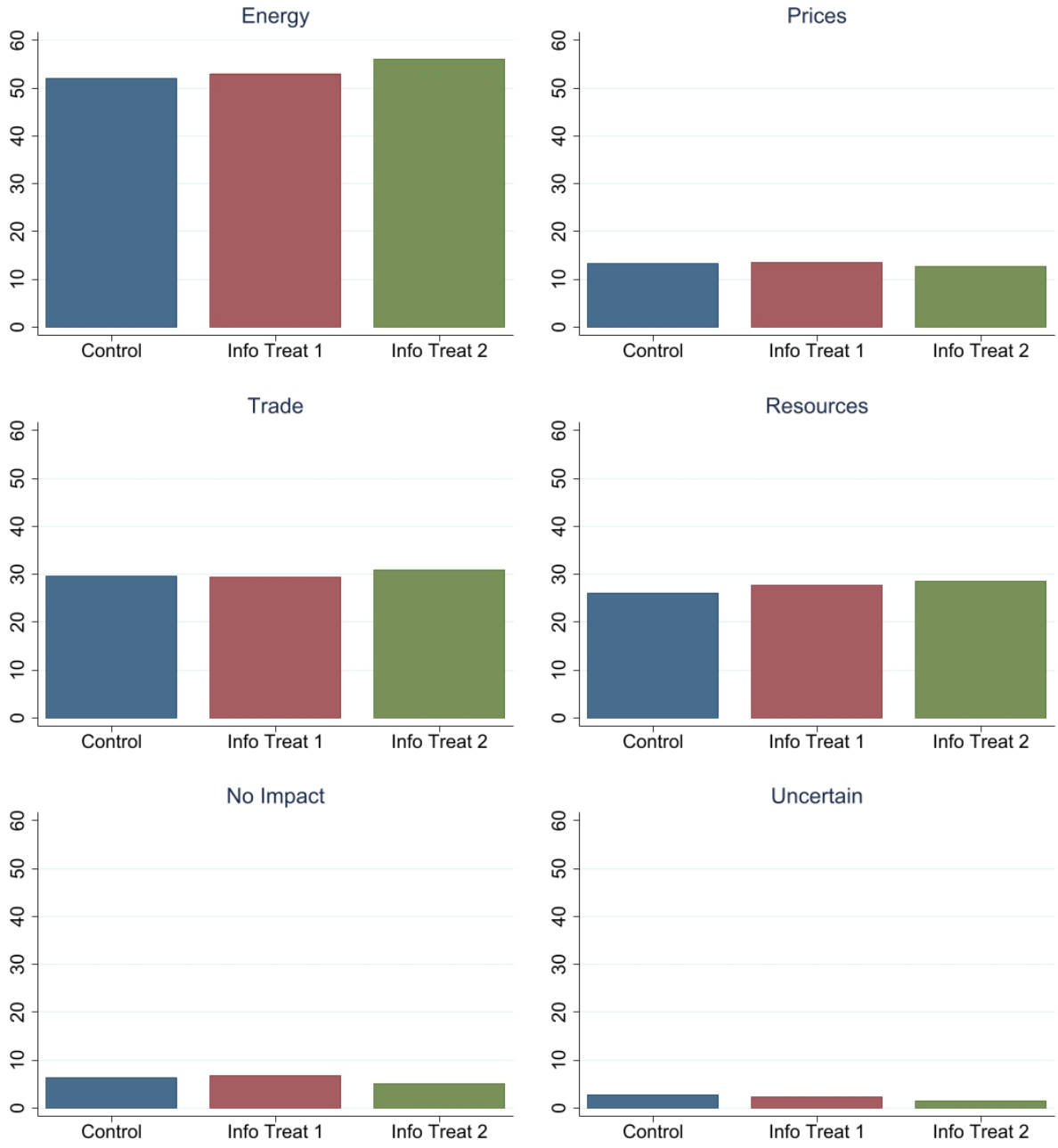
Figure 6 plots the distribution of topics in households' answers to the open-ended question "*What are the main considerations regarding the impact of the war on China's economy that come to you mind?*" for three different groups: control group and two information treatment groups. The topic of *Energy* is most frequently mentioned (more than 50%), followed by *Trade* and *Resources (except energy)*. *Prices* also carry some weight. Less than 10% of households express lack of knowledge, either *No Impact* or *Don't Know*. Thus, households' responses to this open-ended question already provide meaningful insights into what really matters for them and justify our study on the impact of the war on energy price inflation. Regarding the heterogeneous responses across different groups, supply chain disruptions on energy, other resources and trade due to the war are a more pressing concern for the information treatment group 2 in comparison to the households in the control group.[3]

We further explore how narratives about the impact of the war contribute to households' gas price inflation expectations. Table 5 presents the results from a regression of gas price inflation expectations on dummy variables indicating whether a household mentions a specific topic. Households in the information treatment group 2 mentioning "energy" and "prices" predict significantly higher gas price inflation in the next 12 months, suggesting that those who already concerned about gas prices due to the war expect higher inflation than others. By contrast, households viewing the war to have no impact on China's economy predict significantly lower gas price inflation over the next 12 months, indicating lack of knowledge or attention for those respondents. Since we ask these open-ended questions after the information treatment, the evidence presented in this table is

[3]Almost all households agree that the war will increase the price level in China. Thus, the distributions of topics are omitted in households' answers to the open-ended questions "*What are the main considerations regarding the impact of the war on overall prices in China (or gasoline prices in China) that come to you mind?*"

mainly correlational and does not allow for causal conclusions.

Figure 6: Main Topics Respondents Think Regarding the Impact of the War on China's Economy



Notes: This figure shows the percentage of certain topics mentioned in the answers to the open-ended question "*What are the main considerations regarding the impact of the war on China's economy that come to you mind?*" for control group and two treatment groups.

Table 5: Narratives and Gasoline Price Inflation Expectations

	(1)	(2)	(3)	(4)	(5)	(6)
Prior	0.67***	0.67***	0.68***	0.68***	0.67***	0.67***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Info Treat 1	2.67**	2.78**	2.30*	2.32*	2.93**	2.99***
	(0.60)	(0.74)	(0.76)	(0.88)	(0.61)	(0.40)
Info Treat 2	1.78**	2.55***	2.67***	2.43***	3.01***	2.86***
	(0.33)	(0.36)	(0.45)	(0.22)	(0.32)	(0.47)
Info Tr 1*Energy	0.70					
	(1.18)					
Info Tr 2*Energy	1.90*					
	(0.77)					
Energy	-1.22					
	(0.90)					
Info Tr 1*Prices		1.86				
		(2.37)				
Info Tr 2*Prices		1.90*				
		(0.78)				
Prices		-1.66				
		(0.91)				
Info Tr 1*Trade			2.40			
			(1.05)			
Info Tr 2*Trade			0.36			
			(1.80)			
Trade			-0.08			
			(1.03)			
Info Tr 1*Res				2.55		
				(1.67)		
Info Tr 2*Res				1.33		
				(0.89)		
Resources				-0.99		
				(0.95)		
Info Tr 1*No Imp					1.47	
					(2.46)	
Info Tr 2*No Imp					-4.22*	
					(1.57)	
No Impact					-0.74	
					(1.86)	
Info Tr 1*Unc						2.44
						(3.30)
Info Tr 2*Unc						-0.82
						(4.01)
Uncertain						3.68
						(3.73)
Obs	2,500	2,500	2,500	2,500	2,500	2,500
R-sq	0.81	0.81	0.81	0.81	0.81	0.81

Notes: The dependent variable is households' post-information-treatment mean expectation of the gasoline price inflation over the next twelve months. Energy, Prices, Trade, Resources, No Impact and Uncertain are dummy variables indicating whether a household mentions a specific topic. Demographics are controlled but not reported in the table. Data sets have been winsorized at the 5th and 95th percentile. Robust standard errors clustered at the city level are in parentheses. *, ** and *** denote statistically significant at 10%, 5%, and 1% level, respectively.

6 Conclusion

This paper has provided novel insights into the expectations formation of Chinese consumers through a new survey conducted in the midst of the Russian invasion of Ukraine. We used a combination of approaches – a randomized controlled trial and text analysis of open-ended responses – to investigate consumers' knowledge of prior gas price inflation, expectations of future gas price inflation, and beliefs about the effects of recent geopolitical events.

On average, the survey respondents underestimated recent gas price inflation, and revised their expectations upwards in response to receiving more information. A somewhat surprising result is that respondents who received information about previous gas prices had *higher* uncertainty than the control group. Receiving additional information should typically be expected to reduce uncertainty, but surprising news about large shocks can have counterintuitive effects. We also find that respondents primarily expect the war to affect the Chinese economy through its impact on oil and energy. This indicates that many consumers are aware of the large role of Russia in energy markets and the potential of the war to limit supply and increase energy prices.

This has been one of the first studies of Chinese consumers' economic expectations. We believe that understanding the drivers of Chinese consumers' expectations should be an active area of research. Future studies might consider time variations in Chinese consumers' expectations, test for responsiveness to other information treatments or policy announcements, and compare their stability and accuracy to the expectations of professional forecasters. Future studies could also analyze the effects of Chinese consumers' expectations on their consumption in more detail.

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A Additional Tables and Graphs

Table A.1: Regression of Overall Inflation Expectations on Gasoline Price Inflation Perceptions and Expectations

	(1)	(2)	(3)	(4)
Perceived gas price infl	0.09***	0.09***		
	(0.01)	(0.01)		
Expected gas price infl			0.32***	0.32***
			(0.02)	(0.02)
Perceived overall infl	0.67***	0.66***	0.53***	0.53***
	(0.03)	(0.03)	(0.03)	(0.03)
Age 30-44		-0.52		-0.03
		(0.53)		(0.57)
Age 45-59		-0.80		-0.08
		(0.45)		(0.57)
Age 60 or above		-0.75		-0.23
		(0.54)		(0.44)
Female		0.63		0.31
		(0.47)		(0.41)
Middle sch. or below		0.12		0.07
		(0.16)		(0.23)
High school		0.02		-0.18
		(0.22)		(0.09)
Emp Public		-0.74		-0.61
		(0.68)		(0.60)
Emp private		-1.38		-1.11
		(0.85)		(0.82)
Emp Others		-1.13*		-0.98
		(0.41)		(0.55)
Car ownership		-0.20		-0.47**
		(0.23)		(0.08)
Low income		-0.12		-0.06
		(0.10)		(0.13)
Obs	2,500	2,500	2,500	2,500
R-sq	0.83	0.83	0.86	0.86

Notes: The dependent variable is households' expected overall inflation over the next twelve months. The key variables of interest are the perceived (Columns 1 and 2) and expected (Columns 3 and 4) gas price inflation. City fixed effects are controlled. Different sets of demographics are controlled. Data sets have been winsorized at the 5th and 95th percentile. Robust standard errors clustered at the city level are in parentheses. *, ** and *** denote statistically significant at 10%, 5%, and 1% level, respectively.

Table A.2: Regression of Households' Perceptions and Expectations on Their Background

	(1)	(2)	(3)	(4)
	Inflation Perceptions		Inflation Expectations	
	Overall	Gasoline	Overall	Gasoline
Age 30-44	-2.06*	-1.68	-2.05**	-2.84**
	(0.85)	(0.85)	(0.37)	(0.70)
Age 45-59	-2.44	-2.39	-2.63**	-3.91**
	(1.34)	(1.34)	(0.68)	(1.23)
Age 60 or above	-2.37	-2.16	-2.52*	-3.17**
	(1.70)	(0.96)	(0.83)	(0.60)
Female	0.11	-1.90	0.52	0.47
	(1.34)	(0.90)	(1.24)	(0.73)
Middle sch. or below	1.77	1.31	1.42*	1.26
	(0.77)	(1.20)	(0.59)	(1.01)
High school	2.62**	1.04	1.85*	1.97*
	(0.80)	(1.15)	(0.64)	(0.62)
Emp public	-2.30	-1.75	-2.43	-1.84
	(1.37)	(1.08)	(1.61)	(1.20)
Emp private	-2.98*	-1.81**	-3.52*	-2.58**
	(1.04)	(0.39)	(1.29)	(0.76)
Emp others	-2.97*	-2.19**	-3.30**	-2.30**
	(0.94)	(0.45)	(0.83)	(0.71)
Car	2.50**	1.74*	1.62*	2.35
	(0.46)	(0.59)	(0.51)	(1.10)
Low income	-2.52*	-0.85	-1.86*	-1.44
	(0.81)	(0.89)	(0.63)	(0.89)
Obs	2,500	2,500	2,500	2,500
R-sq	0.66	0.73	0.64	0.62

Notes: The dependent variables are overall inflation perception (Column 1), gasoline inflation perception (Column 2), overall inflation expectation (Column 3), gasoline inflation expectation (Column 4), respectively. City fixed effects are controlled. Data sets have been winsorized at the 5th and 95th percentile. Robust standard errors clustered at the city level are in parentheses. *, ** and *** denote statistically significant at 10%, 5%, and 1% level, respectively.

Table A.3: Keywords Defining the Impact of the War on China's Economy Topics

(1) Energy	(2) Prices	(3) Trade	(4) Resources
Crude oil	Climb	Export	Agricultural products
Crude oil price	Cost	Foreign trade	Car
Energy	Elevated	Global	Commodity
Energy price	Improve	Import	Corn
Gasoline	Increase	Import and export	Domestic
Gasoline price	Price	Imported goods	Food
Natural gas	Price increase	International	Goods
Oil	Price level	Power	Grain
Oil price	Rise	Sanction	Market
Petroleum	Rose	Trade	Material
	Stock market	Transport	Products
	Volatility	United States	Raw materials
		World	Resources
			Supply
			Wheat

Notes: The table lists the keywords that fall into each of the topics in the responses to the open-ended question "*What are the main considerations regarding the impact of the war on China's economy that come to you mind?*"

Figure A.1: Main Considerations about the Impact of the War (in Chinese)

(a) **Impact of the war on China's economy**

(b) **Impact of the war on overall prices in China**

(c) **Impact of the war on gasoline prices in China**

Notes: Word clouds based answers to open-ended questions about respondents' main considerations regarding the impact of the war on (a) China's economy, (b) overall prices in China and (c) gasoline prices in China.

Figure A.2: Survey Questions in Chinese

本调查是代表中国人民大学应用经济学院进行的。我们想了解您对物价变化的看法和预期。这项调查大约需要 10 分钟时间完成，您的回答将被严格保密。

Q1.您的年龄 __?

Q2.您的性别
__男
__女

Q3.您的最高学历
__初中及以下
__高中
__大学及以上

Q4.您的就业情况
__公共部门就业
__私营企业就业
__个体就业
__退休
__学生
__无工作
__其他_____

Q5.您是否拥有汽车
__拥有至少一辆汽车，无贷款
__拥有至少一辆汽车，支付贷款
__没有汽车

Q6.您的个人月收入是
__人民币 5000 元以内
__人民币 5000-1 万元
__人民币 1 万-2 万元
__人民币 2 万-3 万元
__人民币 3 万-5 万元
__人民币 5 万-8 万元
__人民币 8 万元以上
__其他_____

Q7.您现在居住工作的城市是？
__北京
__上海
__广州
__深圳

以下问题将询问您关于**过去**价格变化的看法。如果您认为价格上升了，请提供百分比变化的正值。如果您认为价格下降了，请提供百分比变化的负值。
Q8.在**过去** 12 个月内，您认为经济中的总体物价变化比例是多少？__%
Q9.在**过去** 12 个月内，您认为汽油价格的变化比例是多少？__%

以下问题将询问您关于**未来**价格变化的看法。如果您认为价格上升了，请提供百分比变化的正值。如果您认为价格下降了，请提供百分比变化的负值。
Q10.在**未来** 12 个月内，您认为经济中的总体物价变化比例将会是多少？__%
Q11.在**未来** 12 个月内，您认为汽油价格的变化比例将会是多少？__%

将受访者随机分配到三个同等规模的小组
第 1 组：对照组，直接进入后续问题。
第 2 组：看到附加信息“中国的汽油价格在过去 12 个月内上涨了 34%。”
第 3 组：看到附加信息“中国的汽油价格在过去 12 个月内上涨了 34%。部分涨幅归因于俄罗斯与乌克兰之间的战争。”

Q12.您认为在未来 12 个月内，中国汽油价格变化最高，中间，和最低比例是什么？如果您认为价格将继续上升，请提供百分比变化的正值。如果您认为价格会下降，请提供百分比变化的负值。
最高：__%
中间：__%
最低：__%

Q13.针对您预期的汽油价格三种变化，您认为每种情况发生的可能性是多少？
汽油价格变化最高的可能性：__%
汽油价格变化中间的可能性：__%
汽油价格变化最低的可能性：__%
可能性须大于 0，且加总为 100

Q14.在未来 12 个月内，您打算购买以下哪种产品？（请选择所有适用选项。）
__一套房子
__一辆汽车
__一台电脑
__一部手机
__以上都不是

以下三道为开放性问题，这些问题没有正确或错误的答案。请使用下面的文本框进行回答，答案没有字数上限，您的意见和想法对我们的研究十分重要！

当您想到俄罗斯与乌克兰间的战争：
Q15.关于俄乌战争对**中国经济**的影响，您认为主要有哪些方面？____
Q16.关于俄乌战争对**中国整体物价**的影响，你认为主要有哪些方面？____
Q17.关于俄乌战争对**中国汽油价格**的影响，你认为主要有哪些方面？____