Gas price expectations of Chinese households☆

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ABSTRACT

We study the formation of Chinese consumers' gas price and inflation expectations using a newly-conducted survey of 2,500 Chinese households. 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 2022 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 increased respondents' gas price inflation expectations by about 3 percentage points. We use textual analysis of households' open-ended responses to study the reasons behind their reported expectations and relationship between beliefs, narratives, and spending plans.

1. Introduction

Understanding Chinese consumers' economic expectations is important given China's large and growing share of global income and consumption. Yet there is very limited literature on their expectations, mostly due to limited data availability. An enormous literature studies the expectations of United States and European consumers' expectations using well-known household surveys, but comparable surveys do not exist for China. Thus, to learn more about how Chinese consumers form their expectations and how their expectations affect their consumption plans, we conducted our own survey of 2,500 consumers in four major Chinese cities in April 2022. Our survey incorporated a randomized information experiment to provide causal evidence on expectation formation.

In particular, our survey is focused on consumers' perceptions and expectations of gas prices and inflation and their consumption plans in a time of high geopolitical uncertainty — the war between Russia and Ukraine. Our information experiment allows us to test the response of expectations and consumption plans to the provision of information about past gas price inflation. First, 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.

Next, we 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 Ukraine war changes their interpretation of the economic information that we provide. Finally, we 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 with publicly available information, indicating departures from full-information rational expectations (Binder and Rodrigue, 2018). This is also the case in our survey, as respondents in both treatment groups have significantly higher post-treatment expectations than the control group. But a result that differs from most earlier studies is that respondents who were exposed to the information treatments have *higher* uncertainty than respondents who were not. In other words, we show that information provision can in some contexts increase uncertainty, a departure from Bayesian updating.

We do not find a significant difference between the post-treatment expectations of the respondents in the two treatment groups, suggesting that the Ukraine war was already highly salient to our respondents, so priming them to think about it had little additional effect. Indeed, our analysis of respondents' open-ended descriptions of the effects of the war on the Chinese economy shows that even in the control group, respondents were well-aware of the impact on energy and prices. We do not find a direct effect of the information treatments of gas price inflation expectations on the number of durable goods that a respondent intends to purchase. However, we find that consumers who are *uncertain* about the effects of the war on the Chinese economy, as evidenced by their open-ended responses, plan to purchase fewer durables than other respondents. This could indicate that high uncertainty, including geopolitical uncertainty, reduces consumption.

In a closely related paper, Dräger et al. (2022) surveyed 145 tenured economics professors in Germany close to the start of the war, from February 22 to March 1, and found that the Ukraine war increased inflation expectations by about 0.75 percentage points. As expectations formation of the general public can differ notably from that of experts (Carroll, 2003), they also used data from the Bundesbank Online Panel of Households in the same date range. This showed that German consumers' inflation expectations increased by 0.35 percentage points immediately following the war. We also study expectations formation following the war, but the timing, sample, and some parts of the focus of our paper differ from theirs, so results are not directly comparable.

Namely, we focus on Chinese households, rather than German professors and consumers, and our survey was conducted several weeks later, in April. By the time of our survey, oil and gas prices had already been rising in response to the war, and the Council of the European Union was discussing the possibility of imposing sanctions on Russian oil that would potentially drive prices up further still.[1] Thus, while Dräger et al. (2022) measure the effect of the war itself on inflation expectations, we instead study how information provision can affect expectations in a time of high geopolitical uncertainty.

Another difference is that our main focus is on gas price expectations rather than on aggregate inflation expectations. Our focus on gas price 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; Choi et al., 2018; Klepacz, 2021). Nasir et al. (2020a,b) show that the relationship between oil shocks and inflation expectations can vary across countries; for example, the response is asymmetric in the United Kingdom, New Zealand, and Norway but symmetric in Sweden and Denmark. The literature on consumers' formation of gas price expectations is more limited. Anderson et al. (2011, 2013) show that respondents to the Michigan Survey of Consumers typically expect future real gas prices to equal current real gas prices. Aladangady and Sahm (2015) show that movements in expected gas price changes are informative of actual changes in gas prices, and that consumers who expect gas prices to fall report more optimism about their own income and more favorable spending attitudes. Binder (2018), also using Michigan Survey data, finds that consumers believe that gas price inflation is negatively autocorrelated and that gas price expectations have a moderate passthrough into core inflation expectations.

Our work is also related to a broader literature that studies the causal impact of public information on inflation expectations using natural experiments 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). Finally, in our analysis of households' open-ended discussions, we also contribute to a growing literature on narratives in economics (Shiller, 2017; Andre et al., 2021; Ferrario and Stantcheva, 2022).

The rest of the paper proceeds as follows. Section 2 provides contextual information about Chinese consumers' exposure to oil and gas prices and about oil and gas prices in the lead-up to our survey. Section 3 describes the Chinese household survey. Section 4 presents households' beliefs regarding gasoline price inflation. Section 5 uses randomized controlled trials to explore the causal impact of public information on households' expectations. Section 6 elicits households' first-order concerns by analyzing open-ended survey questions and investigates the relationship between narratives, beliefs, and consumption intentions. Section 7 concludes. Additional tables and graphs, as well as survey questionnaire in both Chinese and English, are relegated to an online appendix.

2. Oil and Gas in China

Fig. 1 shows time series of gas price inflation and consumer price index (CPI) inflation in China since 2011. A shaded gray bar indicates our survey dates, in April 2022. Gas prices fluctuate substantially in China despite the regulatory environment, which alters the passthrough from oil to gasoline prices. In particular, gas prices 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. Gas price inflation is quite volatile, with a mean of 1.8% and standard deviation of 14% over this period.

Households in China are exposed to gas and energy prices in several ways. Car owners, of course, purchase gasoline. Regarding home heating, the urban area of Beijing relies on central heating, and the rural area mostly relies on coal heating; for Shanghai, Guangzhou, and Shenzhen, the urban area relies on electricity, and the rural area relies on electricity and coal heating (Guo et al., 2015).

The Ukraine war in February 2022 has affected the global economy through many different channels. Chinese consumers were economically affected by the war because of China's trade relations with both Russia and Ukraine. China is a major importer of oil and gas from Russia, and in particular is the largest purchaser of Russian crude oil.[2] Moreover, in 2021, 29% of China's corn imports came from Ukraine.

The impact of the war on oil and gas prices began quickly. Fig. 2 displays the prices of crude oil and gasoline in 2022, again with our survey dates shaded in gray. Between the war and the start of our survey, oil and gas prices had risen notably. Volatility in oil prices at higher frequency likely contributed to heightened uncertainty about future prices.

3. Survey design and sample

Our survey of 2500 respondents was conducted by DATA100, a market research company that specializes in online survey studies, from April 19 to 25, 2022. Questionnaires were distributed using cell phone applications to residents aged 15 years old and above 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. As shown in online appendix Table A.1, 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.

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[1] A sanctions package was agreed upon at the end of May that included sanctions on crude oil and petroleum products (European Council, 2022).

[2] 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/.

Fig. 1. Consumer Price Index Inflation and Gasoline Price Inflation
Notes: Figure shows consumer price index (CPI) inflation and gas price inflation, percent change from 12 months prior. CPI data is from the National Bureau of Statistics of China and gas price data is from the National Development and Reform Commission of China.
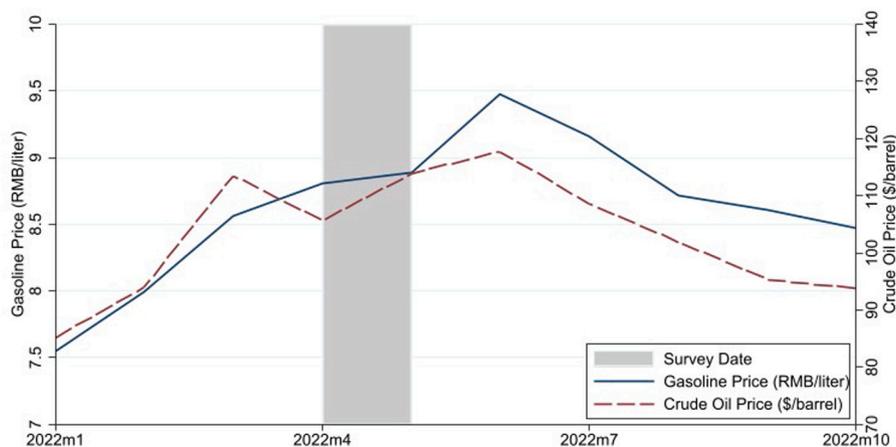
Fig. 2. Crude Oil Price and Gasoline Price around the Survey Period
Notes: Figure shows crude oil prices in dollars per barrel and gasoline prices in RMB per liter. Oil price data is from OPEC and gas price data is from the National Development and Reform Commission of China.

The survey was conducted in Chinese, and the Chinese and English versions of the survey questions are in the appendix.

First, we solicited respondents' priors about overall and gas price inflation. We instructed, "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 asked:

- Over the **past** 12 months, by what percentage do you think overall prices in the economy have 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 assigned respondents to three equally-sized groups. The control group (Group 1) proceeded directly to the follow-up questions. The treatment groups (Groups 2 and 3) received 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 asked for respondents' density forecasts, to avoid confusing them by repeating the same question. We first asked, "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 asked, "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 provided three probabilities.

Let E_{iH}, E_{iM}, and E_{iL} correspond to the high, medium, and low values that the respondent i provides, and P_{iH}, P_{iM}, and P_{iL} correspond to the probabilities that respondent i assigns to these outcomes. Then the respondent's posterior gas price inflation expectation is given by:

$$PostExp_i = \sum_{s=H,M,L} E_{is} P_{is}, \tag{1}$$

and posterior uncertainty is given by:

$$PostUnc_i = \sqrt{\sum_{s=H,M,L} (E_{is} - PostExp_i)^2 P_{is}/2} \tag{2}$$

Next, we asked about planned consumption: "In the next 12 months, which of the following do you plan to purchase? (Select all that apply.)" Options included a house or apartment, a car, a computer, a cellphone,

Table 1
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 1st and 99th percentiles. 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 deviations across responses (i.e. disagreement) are reported in the parenthesis.

and none of the above. Dummy variables $House_i$, Car_i, $Computer_i$, and $Cellphone_i$ indicate that respondent i reports an intention to purchase these goods. At the end of the survey, we ask three open-ended questions. Respondents are asked to discuss their main considerations concerning the impact of the war on the Chinese economy, on inflation, and on gas prices.

4. Expectations and perceptions

Table 1 summarizes beliefs about gas price inflation in the pre- and post-treatment periods, by city. As shown in Panel A, the respondent on average 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 similar across cities, though there is substantial cross-sectional variation (disagreement). This cross-sectional variation can be seen more clearly in online appendix Figure A.1.

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 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 5 will use regression analysis to formally test for effects of the information treatments.

Appendix Figure A.2 shows that respondents' expectations and perceptions of gas price inflation are highly correlated, while Figure A.3 shows that beliefs about overall and gas price inflation are highly correlated. Appendix Figure A.4 compares prior and posterior inflation expectations for the control group, showing that the relationship is tight despite differences in question wording. Appendix Table A.2 shows that 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.3 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.

5. Effects of information provision on gas price inflation expectations

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

$$PostExp_i = \beta_1 Treat1_i + \beta_2 Treat2_i + \alpha Prior_i + \gamma Z_i + \varepsilon_i, \qquad (3)$$

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.*" 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 2. 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 2 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. (2023). 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.

Appendix Tables A.4, A.5, and A.6 show that our results are very similar if we do not winsorize the data, if we use Huber regressions to the original observations as an approach to dealing with outliers, or if we do not include demographic controls. Appendix Table A .7 compares regression results with or without controlling for pre-treatment gas price inflation expectations. The estimated treatment effects remain similar, but have lower precision.

Other tables in the appendix consider the inclusion of respondents' prior perceptions and/or overall inflation expectations and perceptions. Appendix Table A.8 includes not only controls for prior expectations, but also for prior perceptions of gas price inflation. In all specifications, the information treatments increase gas price expectations, and posterior gas price expectations depend relatively more on prior expectations than on prior perceptions. Likewise, results are quite similar if we control for prior overall inflation perceptions and expectations (Table A.9). Both perceptions and expectations of overall inflation remain significantly correlated with gas price expectations in Table A.9, whereas the prior perception of current gas prices is not significantly correlated with posterior gas price expectations in Table A.8 once prior gas price expectations are controlled for. If prior expectations of both gas and headline inflation are included in the same specification, priors regarding gas price inflation play a relatively larger role than overall inflation (Table A.10).

Our finding that the two information treatments have nearly identical effects on expectations indicates that making the Ukraine war more salient does not change how consumers respond to the information treatment about prior gas prices. This, in turn, implies that the war was likely already quite salient to consumers, and that they recognized that it was associated with higher gas prices. Analysis of the open-ended questions we asked respondents at the end of the survey supports this explanation. Recall that we asked respondents to describe the main considerations that come to their mind regarding the impact of the war on China's economy, overall prices in China, and gas prices in China.

We analyze the original responses in Chinese, but present results translated into English in the main text. Results in Chinese are in Appendix Figure A.5. 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". Fig. 3 plots word clouds of the frequency of the top 30 words derived from the responses. The font size of a word is proportional to its frequency. For the impact of the war on China's economy, households' responses center 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. We note that this is the case for the control group as well as the treatment groups. Thus, even without our information provision, households were aware that the war was raising energy prices. In the next section, we use topic analysis to study households' beliefs about the impact of the war on China's economy in a more quantitative way, and we examine the relationship between these beliefs, information treatments, and spending intentions.

Table 2

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 winsorized at the 1st and 99th percentile. Robust standard errors clustered at the city level are in parentheses.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

6. Topic analysis and consumption intentions

A shortcoming of word clouds, like those presented in the previous section, is that they do not account for synonyms. To address this limitation, we perform topic analysis on the responses concerning the impact of the war on China's economy. Since the open-ended responses are quite short, usually a single phrase or sentence, we select topics and classify responses by hand, rather than using an automated method, like Latent Dirichlet Allocation (LDA), which is more suitable for longer texts (Ferrario and Stantcheva, 2022). 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",
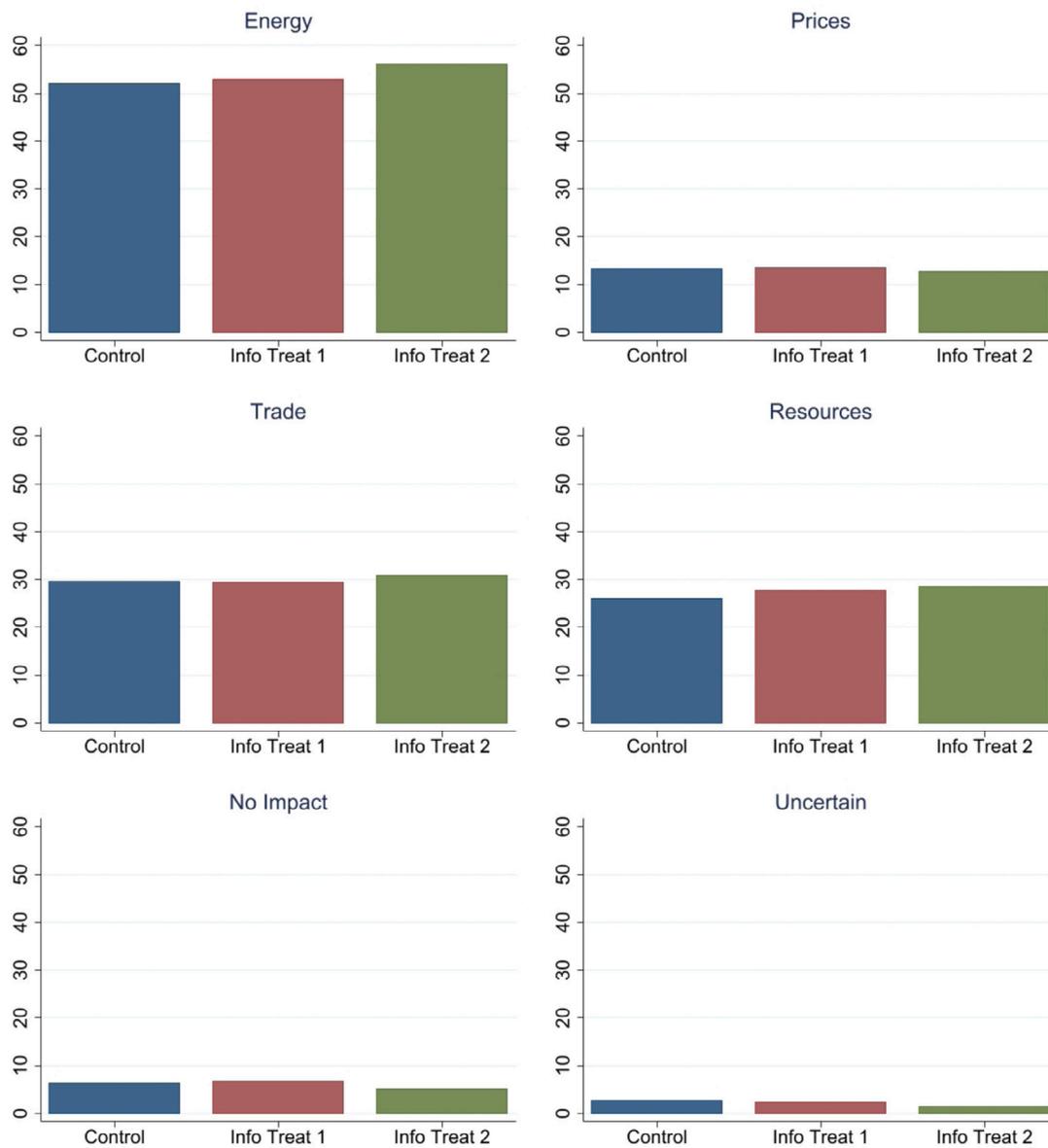
(a) Impact of the war on China's economy

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

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

Fig. 3. Main Considerations about the Impact of the War.
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.

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.11 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.

Fig. 4 shows that *Energy* is the most common topic for the control group and both treatment groups, followed by *Trade*, *Resources (except energy)*, and *Prices*. Less than 10% of households express lack of knowledge, either *No Impact* or *Uncertain*. The treatment and control groups report similar considerations (or "narratives"), indicating that our treatments led respondents revise their *quantitative* expectations without changing the narratives underlying their beliefs.

Next, we explore the relationship between narratives, expectations, and spending intentions. Appendix Table A.12 summarizes the share

of respondents who express an intention to buy each type of durable good. Note that 91 percent of respondents anticipate purchasing at least one of the durable goods. About 38 percent of respondents expect to buy exactly one of the listed goods, 31 percent expect to buy two, 16 percent expect to buy three, and 6 percent expect to buy all four. The average respondent expects to buy 1.7 of the listed goods, with cellphones the most popular purchase. Our outcome of interest is the number of goods the respondent intends to purchase, or the sum of $House_i$, Car_i, $Computer_i$, and $Cell_i$.[3]

First, we note that the information treatments themselves have no detectable impact on the number of durables a respondent intends to buy: the mean is 1.7 in each group. We also find no relationship between durable spending intentions and gas price inflation expectations,

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[3] We focus on the sum rather than on the single-good dummy variables, since there is a lot of idiosyncratic variation in intentions to purchase a particular good. For example, a respondent who just purchased a car is unlikely to intend to purchase another one soon, regardless of macroeconomic expectations.

Fig. 4. Considerations 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 your mind?*" for the control group and two treatment groups.

in an ordinary least squares (OLS) regression or in an instrumental variable regression in which we instrument for expected gas price inflation using the information treatments (Appendix Table A.13). This may not be surprising; other research shows that inflation expectations have mixed or small effects on consumption plans (see review in Binder and Brunet, 2022), and the effects of gas price expectations on consumption plans could be even more muted. Moreover, the information treatments increase gas price expectations while also increasing uncertainty; higher expectations and higher uncertainty may have opposite effects on consumption plans, leading to no detectable effect on net.

Recall that the open-ended responses were solicited *after* the information treatments, so we cannot make causal inference about the effects of these considerations (which we call "narratives") on expectations and consumption. We can, however, study the correlational relationships. In Table 3, we regress the number of durables a respondent intends to purchase on dummy variables indicating that the

respondent mentioned each topic (energy, trade, prices, resources, no impact, uncertain).[4] Column 1 only includes the control group, while Column 2 includes the full sample. In both cases, the key result is that respondents who are *uncertain* about the effect of the war on the Chinese economy plan to purchase fewer durables. The effect size is substantial — about 0.6 fewer durables, where the mean is 1.7. In Columns 3 and 4, we also include gas price inflation and overall inflation expectations, again for just the control group and for the full sample. The negative coefficient on "uncertain" remains statistically significant and of similar magnitude. Gas price inflation expectations are uncorrelated with spending intentions, while inflation expectations have a very small positive association, as has been found in other

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[4] Controlling for posterior gas price expectations and posterior forecast uncertainty does not change our results; see Table A.14.

Table 3
Spending intentions, narratives, and expectations.

	(1) Control group	(2) Full	(3) Control group	(4) Full
Energy	0.04	−0.02	0.07	−0.00
	(0.12)	(0.06)	(0.11)	(0.06)
Trade	−0.01	−0.08**	0.00	−0.07**
	(0.08)	(0.02)	(0.07)	(0.02)
Prices	−0.01	−0.01	0.01	0.00
	(0.11)	(0.01)	(0.10)	(0.00)
Resources	0.01	−0.01	0.02	−0.00
	(0.05)	(0.04)	(0.05)	(0.03)
No impact	−0.01	−0.01	0.01	−0.00
	(0.06)	(0.08)	(0.05)	(0.09)
Uncertain	−0.58***	−0.56**	−0.54***	−0.55**
	(0.08)	(0.13)	(0.07)	(0.12)
Expected gas inflation			0.00	0.00
			(0.00)	(0.00)
Expected inflation			0.01	0.005*
			(0.00)	(0.00)
Obs	834	2500	834	2500
R-sq	0.08	0.08	0.08	0.08

Notes: Dependent variable is the number of durable goods the respondent intends to purchase. Energy, Trade, Price, Resources, No Impact, and Uncertain refer to the topic categorizations of the respondents' open-ended description of the impact of the war on the Chinese economy. Regressions include demographic controls, city fixed effects, and constant term. Robust standard errors clustered at the city level are in parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

literature (Binder and Brunet, 2022). The negative association between uncertainty and spending intentions could indicate that high uncertainty reduces willingness to make big-ticket purchases. The direction of causality could also run in the other direction. Consumers who are not planning to make any big purchases may have less reason to pay careful attention to economic developments.

7. Conclusion

This paper has provided novel insights into the gas price expectations formation of Chinese consumers through a new survey conducted in the midst of the Ukraine war. 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 interpretations 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. This is consistent with other survey-based information experiments in macroeconomics, which typically show that respondents respond in a Bayesian manner to information treatments. 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. The information treatment may have revealed to respondents their lack of knowledge about recent events, driving up their uncertainty.

In our topic analysis of respondents' discussions of the impact of the war, we 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. Our topic analysis also shows that respondents who are uncertain about the effects of the war have substantially lowered intentions to purchase durables than other respondents. This highlights a

potential channel through which geopolitical uncertainty can suppress consumption, amplifying the economic effects of geopolitical shocks. We consider this an important area for future research.

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.

CRediT authorship contribution statement

Zidong An: Proposing the research idea, Conducting the survey Performing the analysis, Drafting the manuscript, Editing the manuscript and responding to the editor/referees. **Carola Binder:** Proposing the research idea, Conducting the survey Performing the analysis, Drafting the manuscript, Editing the manuscript and responding to the editor/referees. **Xuguang Simon Sheng:** Proposing the research idea, Conducting the survey Performing the analysis, Drafting the manuscript, Editing the manuscript and responding to the editor/referees.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.eneco.2023.106622.

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