Disaster Aid and Support for Mandatory Insurance: Evidence from a Survey Experiment

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Abstract

Dealing with the consequences of climate change will put an increasing burden on public and private finances. We use the example of floods in a survey experiment among 8,000 German households to elicit households' preferences for climate adaptation policies. In Germany, as in many countries, we observe low insurance penetration in combination with high ex-post state aid in case of large events. We find that prior expectations of flood aid, conditional on severe flooding, are low. Providing information about high ex-post aid increases support for a mandatory flood insurance scheme, which is seen as fairer compared to public aid. We also show that this result is driven by respondents updating their expectations, and reactions are stronger among uninsured households in low-risk areas. In contrast, information about announcements to cut flood aid does not significantly alter expectations and views. We conclude that fairness concerns are relevant in the discussion of public and private responsibilities in dealing with climate change.

1 Introduction

One of the most significant and dangerous consequences of climate change is the increasing prevalence of flood events. Recent numbers suggest that between 2002 and 2021, on average more than 80 million people around the world become victims of floodings each year (CRED, 2023). Projections suggest that until 2050, the number of people exposed to floodings is expected to grow to 1.8 billion, which constitutes almost one quarter of the world population (Rentschler et al., 2022). The reasons for this projected rapid increase are that the frequency of flood events is accelerating at enormous pace and that number and geographic range of flood risk areas are rising substantially.

For those who do not pay with their lives, the damage caused by such extreme weather events threatens their economic existence. Over the past 20 years, flood events are estimated to have caused an average of 42 billion USD of economic losses per year (CRED, 2023). Yet, even in countries with a high flood risk and well-functioning insurance markets, only a minority of households appears to take out private insurance against natural disasters.[1] As a consequence, governments feel compelled to provide financial support to the victims of flood events and compensate households and firms for their losses so that ultimately, it finds itself caught in a Samaritan's dilemma. However, given that in the future the damages caused by flood events are expected to grow much faster than GDP, the question arises whether governments will be able to maintain this practice. What is more, the provision of aid is also viewed critically because it may reduce the incentives for households to take precautionary measures against potential consequences of extreme weather events, thus involving what has been labelled 'charity hazard' (Raschky and Weck-Hannemann, 2007).

One possible solution that may allow governments to kill not two but three birds with one stone – that is, to ease the pressure on public finances, to overcome the Samaritan's dilemma, and to solve the charity hazard problem – is a mandatory natural hazard insurance. While the introduction of a mandatory insurance scheme is currently debated

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[1]Paleari (2019) reports that in most EU member countries, penetration rates of private natural disaster insurance is far below 50%.

in many countries, to date, only few countries actually have such a system in place.[2] This study pursues two goals. Our first goal is to elicit whether the introduction of mandatory natural hazard insurance would be supported by a majority of private households. The second goal is to assess how people evaluate the trade-off between the public provision of disaster aid on the one hand and mandatory disaster insurance on the other hand. In this context, we also aim to shed light on the reasons why people form their opinions.

To answer these questions, we designed a survey eliciting respondents' attitudes towards mandatory natural disaster insurance that includes an information experiment. The survey was conducted on our behalf by *forsa*, the biggest private survey institute in Germany. Our sample comprises the individual answers of roughly 8,000 representatively selected German citizens. The survey was carried out in November 2021, only four months after parts of Germany were hit by heavy rainfall, causing severe flooding and landslides. This flooding killed more than 180 people and caused damages to property and public infrastructure amounting to billions of euros. This flood event also made the Samaritan's dilemma faced by governments clearly visible. Before the flood event, some German state governments had announced to cut or even abolish public flood aid. After the flood event, the federal government in Germany quickly promised to cover most of the damage to private property suffered by the flood victims.

We utilize these contradictory statements in an information experiment to study the causal effect of public aid expectations on support for mandatory natural disaster insurance. We randomly split our sample of respondents into three groups which we provide with different information. The first group, which serves as our *control group*, only receives generic information about flood risk world-wide. The second group is provided with information about actual aid paid to the victims of the July-2021 floods in Germany (*high aid treatment*). The third group receives information about announcements by German state governments to cut flood aid (*low aid treatment*). In our empirical analysis, we use these information treatments in two different ways. In a first specification, we

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[2]In the US, for example, households who buy a property with a mortgage in a flood-risk area are required to purchase insurance through the National Flood Insurance Program. According to Paleari (2019), only two out of the 27 EU member countries – that is, Denmark and Romania – have mandatory flood insurance for property owners, while some countries are operating a de-facto mandatory scheme, e.g. France (Roth, 2021).

include variables indicating to which treatment group a respondent was assigned as regressors to a multivariate regression model. This allows us to assess how the specific information we provided affected respondents' attitudes toward mandatory natural hazard insurance. In a second specification, we use the information treatments to construct instrumental variables for a two-stage least squares (2SLS) estimation in which we estimate the impact of flood aid expectations on individual support for mandatory natural hazard insurance. To this end, we elicit aid expectations before and after the treatment. Due to the random assignment of respondents to treatment groups, our information experiment provides us with exogenous variation in flood aid expectations. This allows us to identify the causal effect of aid expectations in general – rather than the effect of the specific information our respondents received – on support for mandatory natural disaster insurance.

Our findings from the first specification indicate that the high aid treatment leads to a significant increase in individual support for mandatory natural hazard insurance. Respondents who are informed that the German government paid aid to the victims of the 2021 floods are almost four percent more likely to voice support for mandatory natural hazard insurance than respondents in the control group. Our results from 2SLS estimation corroborate this finding. Here, we find that an increase in aid expectations by 10 percentage points – meaning that respondents expect the government to cover an additional 10% of their losses – increases the likelihood that mandatory insurance is viewed positively by about 3 percentage points. Put differently, the more aid respondents expect the government to pay to the victims of floodings, the more skeptical they become about public aid payments and the greater their support for mandatory natural hazard insurance. Further analysis suggests that this results is driven by fairness concerns. Respondents who are informed about the high aid payments of the German government become more likely to consider mandatory insurance as fairer than aid.

Our descriptive analysis also delivers several interesting insights. Among the (uninformed) control group, we find that 39% of the surveyed households have a positive view of mandatory natural hazard insurance, whereas 27% view it negatively (34% have a neutral view). When asked to compare public disaster aid to mandatory private insurance

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along different dimensions, 55% of respondents state that they believe that public aid imposes higher costs on society than mandatory insurance and 46% consider it to be less fair. However, 41% believe that public disaster aid would be more beneficial to them personally, while 29% believe that the opposite is true. Thus, our findings suggest the introduction of mandatory natural hazard insurance could be supported by a large fraction, if not a majority, of German households in case it comes to a vote.

These results bridge a gap between two strands of literature. On one hand, our approach draws from the literature on the acceptance of climate *mitigation* (policies that seek to reduce carbon emissions). Similarly to D'Acunto et al. (2022), we provide information about current policies and investigate the effect on the views regarding realistic alternatives. Like Dechezleprêtre et al. (2022), we seek to understand households' reasoning behind policy preferences in terms of fairness, effectiveness, and self-interest (along the lines of Stantcheva (2021)). As climate change will increase the frequency and severity of natural disasters, it is important to understand people's views about climate *adaptation* measures.

Second, a large literature (which spans beyond economics) debates political support for government disaster aid schemes, such as the U.S. Federal Emergency Management Agency (Michel-Kerjan, 2010). Flood aid has electoral implications, and voters reward disaster relief spending (Healy and Malhotra, 2009; Chen, 2013).[3] Survey experiments have been often used to study support for different policy measures, e.g. on taxation, migration, and education (see Haaland et al. (2020) for an overview). Our results show that information that public aid is high increases support for mandatory insurance, on fairness grounds.

The remainder of the paper is structured as follows. Section 2 provides background on the recent debate in Germany on mandatory flood insurance. Section 3 explains our survey design, including the information treatments. Section 4 shows the results of descriptive analyses and presents some stylised facts. In section 5, we discuss the results of our information experiment. Section 6 concludes.

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[3]A related literature looks at the effects of flood aid (Kahn, 2005), including on distributional equity (Billings et al., 2022), and the transparency of local institutions (Leeson and Sobel, 2008).

2 Background

In mid-July 2021, extremely heavy rainfall in the German states of Rhineland-Palatinate, Northrhine-Westphalia, and Bavaria led to local flash floods, extreme flooding, and landslides. According to projections by the German Federal Ministry of the Interior, roughly 85,000 people and 10,000 firms were affected, and the damages amounted to more than €40 billion.[4] The German Insurance Association (GDV) reports that about €11.5 billion of the losses were insured. The German government set up an emergency fund to pay up to €30 billion to affected households, firms, community institutions, and for rebuilding infrastructure, which was equivalent to about 1% of GDP.

German households can buy insurance against natural hazards as an add-on to home insurance. Insurance industry data indicate that 45% of all residential properties were insured against natural hazards in 2019, up from 36% five years earlier.[5] Penetration rates across German states vary from 22% in Bremen to 94% in Baden-Wuerttemberg. The indicative cost of insurance against natural hazards is €209 - 406 per year in a high risk area (Ahrweiler, one of the areas most hit by the 2021 floods).[6]

The severe consequences of the floods reinvigorated the political debate regarding a mandatory natural hazard insurance. Proposals for mandatory insurance schemes vary in terms of the deductible;[7] whether natural hazard insurance should become an integral part of property insurance or remain as a standalone, add-on product; and if it is a standalone product, whether households should be automatically opted in (with the possibility to opt out). There are also different ideas of how to deal with existing buildings in high-risk areas and how to support low-income households. Appendix B provides further details on policy proposals. For all these proposals, a key question remains whether households would support mandatory insurance, and how information on flood aid may alter this support. It is on these questions that our survey design focuses.

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[4]Source: https://www.bmuv.de/pressemitteilung/hitze-duerre-starkregen-ueber-80-milliarden-euro-schaeden-durch-extremwetter-in-deutschland. Accessed on 16 February 2024.

[5]Source: Gesamtverband der Deutschen Versicherungswirtschaft (2020).

[6]Data from insurance online portal Check24, retrieved in February 2022. Costs refer to a house with a living area of 180 square meters.

[7]The deductible is the amount of damage up to which the household is responsible. A high deductible would result in a lower premium, but also limited cover and higher potential losses for households.

3 Survey Design

3.1 Survey sample

The survey was conducted online between November 5th and 22nd 2021 by forsa. The sample consists of roughly 8,000 randomly selected participants of the so-called *forsa.omninet panel*. Participants of the forsa.omninet panel are recruited offline via phone as a stratified random sample of the German population. Methodologically, recruitment is based on quota sampling, ensuring that the pool of panel participants is representative of the German population aged 18 or above. However, while recruitment is done offline, the survey itself was conducted online. The online mode allows timely and cost effective polling, while offering the possibility to present visual stimuli. Survey participants answer the questions on their computer, mobile device or TV screen which can be linked to forsa by a set-top-box if the household does not have internet access.

Table 1: Summary statistics on sampled population

	Mean	Std.dev.	Min.	Max.
Female (0/1)	0.46	0.50	0	1
Age	55.01	15.85	18	99
Higher secondary degree (0/1)	0.46	0.50	0	1
Eastern Germany (0/1)	0.14	0.35	0	1
Employed (0/1)	0.59	0.49	0	1
Retired (0/1)	0.29	0.45	0	1
Owner (0/1)	0.60	0.49	0	1
Very worried about flooding (0/1)	0.11	0.32	0	1
Hold insurance (0/1)	0.55	0.50	0	1
Municipality affected by flooding during last 10 years (0/1)	0.24	0.43	0	1

Notes: This table reports summary statistics for the demographics of the survey participants as well as some survey responses. Based on unweighted sample.

Table 1 reports a set of summary statistics for our survey sample. Respondents are almost equally split between men and women and have an average age of 55 years. Nearly half of the sample has a higher secondary degree or a higher level of education and 14% of participants reside in Eastern Germany. In terms of employment, 59% have full-time or part-time employment, while 29% are retired. 60% of participants own a property,

while 11% say that they are very worried about flooding events. 55% state that they hold an insurance against natural hazards. 24% report that they remember their municipality being affected by flooding during the last 10 years.

To account for stratification and in order to correct for potential selected non-response, forsa provides survey weights (calibrated to German census data) for the final sample, which we use in our analysis. We limit the final sample to only include respondents who gave answers on all relevant variables. This leads to a final sample size of 8017 participants.

In the following subsections, we will first describe the outcome variables of main interest in 3.2. Then, the different information treatments are explained in 3.3. The full questionnaire can be found in Appendix C.

3.2 Outcome variables

Our analysis pursues two main goals. The first is to assess whether the provision of information on flood aid can influence public support for mandatory natural hazard insurance. To this end, we asked respondents to indicate how they evaluate the introduction of a mandatory insurance based on a five point Likert scale,[8] which we transform into a 3-point scale (positive, neutral, negative) or dummy variable (positive, non-positive).

The second goal is to shed light on the mechanisms behind the results. To this end, we ask households a couple of additional questions. We elicit beliefs about public aid in case of flooding both before and after the information treatment. Moreover, survey participants are asked about the perceived likelihood of a mandatory insurance after the treatment, in order to shed light on any update in policy expectations. Finally, households are directly asked about the trade-off between public aid and mandatory insurance. Following the lines of Stantcheva (2021), survey respondents state their opinion on i) which solution is fairer, ii) which solution is more beneficial for them personally, and iii) which solution

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[8]Note that we provide a brief description of how mandatory insurance might work: "Compulsory natural hazard insurance would mean that every homeowner would have to insure against floods. (A similar situation applies in Germany, e.g., for motor vehicle liability insurance). Homeowners in flood risk areas would have to pay higher premiums. These premiums can then be passed on to tenants."

comes with higher costs for society.

3.3 Priors and Information Treatments

In the beginning of the questionnaire, we elicit priors on receiving flood aid, conditional on being subject to flood and damage.[9] In the beginning, we set a flooding scenario, aiming to explain participants that we are interested in aid expectations conditional on flooding having happened (so that this expectation is unrelated to expected flood probabilities or damage expectations). We first ask for extensive priors, i.e. if they would expect to receive aid or not:

A) "As you may know, parts of North Rhine-Westphalia, Rhineland-Palatinate, and Bavaria experienced severe flooding in July as a consequence of heavy rain. Imagine your region experiences similar flooding next year. As a result, your property is severely affected by the floods, causing high damage to buildings, household goods, cars, etc. Do you think that the state would assist you financially in this case?"

If respondents report to expect non-zero aid, we ask them to state the amount as a percentage of damages (intensive margin):

B) [if "Yes" in A]: "What do you think: how much financial help would the state provide in this case, expressed as a percentage of the damage to your house / apartment / household goods / car?"

Then, before being confronted with questions concerning their attitudes toward mandatory insurance, the survey participants are randomly split into three equally large groups. The three groups are presented with different information (highlighted text as in the original questionnaire):

- Group 1 (active control): *"According to the United Nations, 71 percent of all natural disasters over the past 20 years have been floods or storms."*

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[9]The wording and the possible answers can also be found in Appendix C.2.

- Group 2 (high aid): *"The federal and state governments have agreed to **provide financial support to the regions affected** by the floods in July. Private households and businesses are to **receive compensation for damage not covered by insurance**. The grants are to amount to **up to 80% of the damage**."*

- Group 3 (low aid): *"In recent years, some German states have announced that they will **no longer pay financial aid to victims of extreme weather events** and other natural disasters. Exceptions are only to be made if the damage is of an existence-threatening magnitude."*

After the information is shown, each of the three groups is asked whether they were aware of the information. By rephrasing the information as a question, we aim to make sure that respondents actually process the information.

We opt for an active control group to ensure that all groups see the same number of questions, and are primed with information related to flooding (see also next section). The control group is not, however, primed on state aid (except due to asking for expectations of public aid twice).

At the end of the survey, we elicit posterior aid expectations by asking very similar questions as for prior expectations. By asking for both prior and posterior expectations, we can measure updates on public aid beliefs that are due to the information treatment.

4 Descriptive Analysis: Support for Mandatory Insurance

Before analyzing the effects of our information treatments, we provide descriptive evidence and present some stylized facts. To this end, we only focus on subjects in the control group, who were not exposed to any information about the provision of public flood aid. We focus on attitudes towards mandatory insurance and show some characteristics which are linked to these attitudes.

Overall, respondents tend to have a positive view towards mandatory insurance.

Figure 1: Views on mandatory insurance and state aid
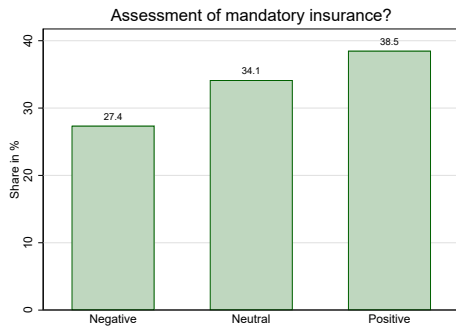
(a) Assessment of mandatory insurance

(b) View about tradeoffs between public aid and mandatory insurance

Notes: The figure shows (a) households' view on the introduction of mandatory insurance (originally on a 5-point Likert scale, broken down to 3 categories here), and (b) their policy responsees on questions comparing state aid and mandatory insurance. In both graphs, we only show responses for households in the control group.

Figure 1a shows the distribution of responses to the question "How would you evaluate a mandatory natural hazard insurance?", on a three-point scale from "negative" to "positive". Less than a quarter of the respondents (27.4%) have a negative or rather negative view on mandatory insurance, a third have a neutral view (34.1%), and a relative majority (38.5%) have a positive or rather positive view. Support is higher among insurance holders and respondents who are worried about flood risk (see figures 4 - 5, Appendix).

To get more insight on participants' attitudes, we also ask them to compare mandatory insurance and public flood aid in terms of costs to society, fairness and individual advantage.[10] Figure 1b shows the distribution of the responses. The majority of respondents (55.3%) believes that public aid has higher costs to society, while only a quarter (23.8%) believe that mandatory insurance has higher costs. About a fifth (24.2%) of the respondents believe that public aid is fairer than mandatory insurance, while almost half (45.8%) believe that mandatory insurance is fairer. Finally, the share of respondents

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[10]We ask the following three questions: i) "The state can take various measures to counter the consequences of floods. It can pay financial aid directly to the victims, or it can oblige households to insure themselves against damage. In your opinion, which measure involves higher costs for the general public?"; ii) "And which measure do you think is more just?"; iii) "And which measure is more financially advantageous for you personally?". The answers are on five-point scale between -2 ("public aid for the victims) and +2 ("mandatory insurance").

who believe that public aid is more advantageous for them personally is higher than the share of those who believe that mandatory insurance is more advantageous (41.3% against 29.0%). To summarize, on average, respondents believe that mandatory insurance is fairer, and less expensive for society than public aid, but they also think that the latter is more advantageous for them personally.

We also see that respondents' view of mandatory insurance is heterogeneous with respect to these dimensions. 43.7% of mandatory insurance supporters think it is more in their financial interest, and 69.1% of mandatory insurance supporters think it is fairer (Figures 6 and 7, Appendix). We do not see a measurable difference in the assessment of social cost.

Beliefs about mandatory insurance may be linked to beliefs about the role of the state versus the role of individuals in dealing with flooding. The views on this are quite dispersed: 39.7% tend to put responsibility for dealing with flooding on the shoulders of the state, compared to 29.2% who see this responsibility with households (see Figure 8, Appendix).[11] We see that indeed, those respondents who see a larger role of the state (private households) are less (more) in favor of mandatory insurance (Figure 10, Appendix). This gives rise to the interpretation that mandatory insurance is indeed seen as a more market-oriented solution with a larger responsibility of private households.

5 Information Experiment about Public Aid

In this section, we discuss the results of the information treatment. As in Section 4, we look at support for mandatory insurance, but now we compare outcomes for the two treatment groups (*high aid* and *low aid*) and the control group.

5.1 Priors and Posteriors about Public Aid

To start with, we investigate prior expectations and check whether the treatment influenced expectations about aid.

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[11]As a comparison, when we ask a similar question about responsibility for fighting climate change, only 12% of the respondents put the responsibility solely on households (Figure 9, Appendix).

Prior to treatment, 51% of respondents expect to receive public aid in case of being affected by a flooding event; 47% do not expect aid, and 2% would not accept it. These numbers represent the extensive margin of aid expectations. At the intensive margin, i.e. conditional on expecting aid, participants believe to receive 36% of damages from the state.

Based on the information about the extensive and intensive margin, we create a *continuous* measure of aid expectations, which assigns a value of 0% to respondents that do not expect aid/ that would not accept aid, and the respective response for the intensive margin question for participants that expect to receive aid. The continuous measure is defined between 0% (expect no aid at all) and 100% (expect full coverage of damage). The benefit of the measure is that it allows us to combine the information on the extensive and intensive margin. Moreover, it helps us to give a quantitative interpretation of the results.

Based on the continuous measure, participants expect to receive 18% of damages from the state on average (Figure 11, Appendix). This suggests that, prior to treatment, quantitative expectations of public aid are rather low and well below the *high aid* treatment amount of 80% of damages.

Figure 2: Priors and posteriors for both treatment groups
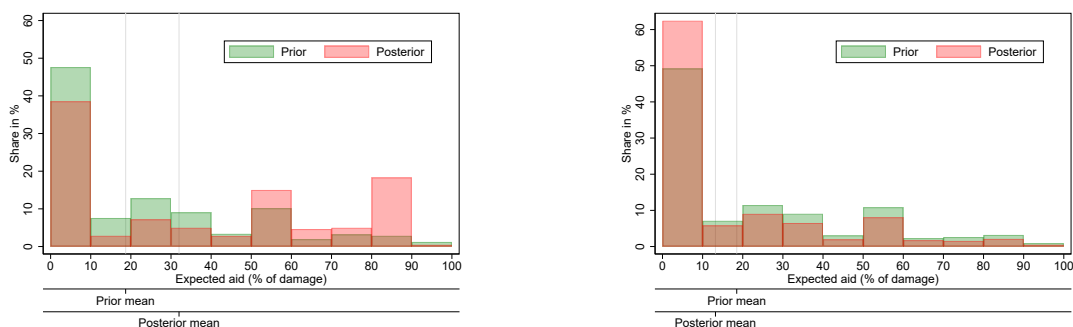
(a) Group 2: High aid treatment   (b) Group 3: Low aid treatment

Notes: The figure compares prior and posterior aid expectations for (a) treatment group 2 (high aid) and (b) treatment group 3 (low aid). Aid expectations are measured as a continuous variable and are defined between 0% (expect no aid at all) and 100% (expect full coverage of damage).

Next, we test whether the treatment affects posterior aid expectations. Following the methodology on prior expectations, we create a continuous measure of posterior

expectations. In line with Bayesian updating, households adjust their expectations: Group 2 participants increase their expectations about public aid, while group 3 participants lower it. Figure 2 highlights the shifts in the distribution expectations. Notably, a significant share of group 2 participants adjust their expectations to 80%, while some of the group 3 participants adjust to 0%. As intended, group 1 participants - the control group - do not change their expectations significantly (see Fig. 12, Appendix).

Table 7 (Appendix) shows regression results for the continuous measure, i.e. the expectation of aid as a percentage of damages. Households in the *high aid* treatment arm increase their expectations by 15 percentage points, whereas participants receiving the *low aid* treatment reduce their expectations by 4 percentage points on average. Given the low priors, it is not surprising that we only see a small effect of the low aid treatment on posteriors. A consistency check shows that prior aid expectations are very similar across treatment and control groups (Table 6, Appendix), i.e. the randomization of the treatment worked well.

Table 6 in the Appendix confirms that the randomization of our information treatments was performed appropriately: subjects across all experimental arms are indistinguishable along observable characteristics and have very similar prior aid expectations on average.

5.2 Average Treatment Effect on Support for Mandatory Insurance

We now turn to the impact of the information treatment on participants' opinion on mandatory insurance. We employ the following empirical model to estimate the average treatment effect:

$$y_i = \alpha + \beta_1 High\ Aid_i + \beta_2 Low\ Aid_i + X_i'\delta + \varepsilon_i \tag{1}$$

Here, y_i captures support for mandatory insurance (in most specifications, as a dummy indicating a positive view of mandatory insurance; we also use the full 5-scale or a 3-scale coding for robustness checks). $High\ Aid_i$ and $Low\ Aid_i$ are dummy variables for whether

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subject i was assigned to the information treatment about high public aid (group 2) or low public aid (group 3). Treatment group 1 (active control) serves as our reference. The vector X_i includes individual-level control variables[12], while ε is the error term. Depending on the outcome variable, we specify equation 1 as an ordered logit model or probit model.

Figure 3 shows the results for the ordered logit estimation. Clearly, the high aid treatment increases support for mandatory insurance: The share of participants that have a positive assessment of mandatory insurance is 3.7 percentage points higher than in the control group. This increase is mirrored by an almost equal decrease in the negative view of mandatory insurance.

Figure 3: Average Treatment Effects on Opinions on Mandatory Insurance
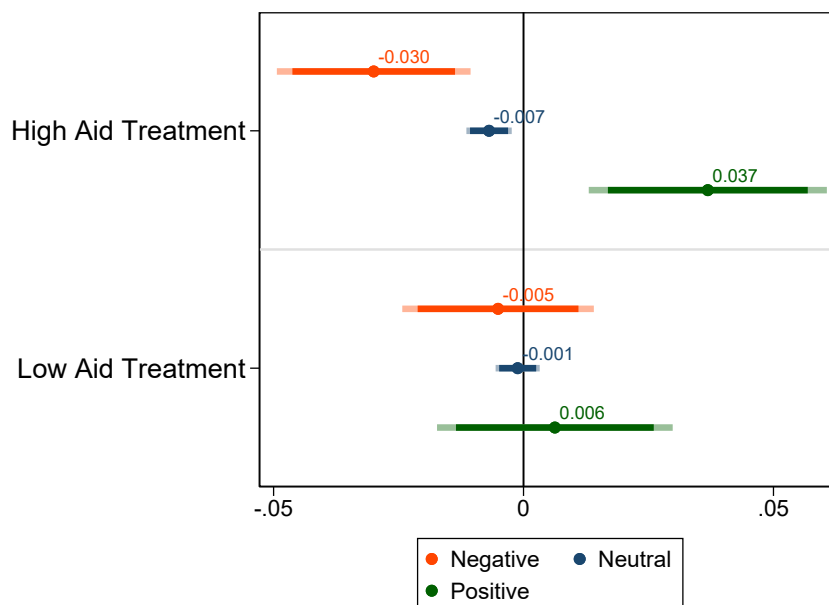
Notes: This figure shows the average treatment effect (ATE) of information on state aid on opinions on mandatory insurance (measured on a 3-outcome scale), based on ordered logit estimation. Benchmark model: no controls, weighted. Non-shaded and shaded areas indicate the 90% and 95% confidence intervals, respectively.

On the other hand, the low aid treatment has no statistically significant effect on support for mandatory insurance. Arguably, aid expectations had been low anyway

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[12]We exclude these in the benchmark model; the set of controls include sex, age, employment status, job type, school education, marital status, number of kids, own income, income of partner, state of residence, insurance status, ownership of real estate, type of building, worries about flooding, prior about public aid and estimated share of people covered by insurance.

(see section 5.1). The treatment may thus not have a large effect on the beliefs of the participants. In the following, we therefore concentrate on the effects of the high aid treatment.

As a robustness test, Figure 13 in the Appendix shows the results for the original outcome variable based on a 5-point Likert scale. The results look similar to our baseline measure. Moreover, Table 8 in the Appendix reports the regression results when using a dummy indicating a positive view of mandatory insurance as the outcome variable. Adding control variables to the specification, or using unweighted regressions does not change the results significantly.

5.3   2-Stage Least Squares Approach (ATT)

In the previous section, we focused on the direct effect of information about public aid on the support for mandatory insurance. We regressed support on the treatment dummies and compared treatment effects. This approach addressed the question how governments' aid *policies* affect public support for mandatory insurance, capturing an overall effect (ATE).

An alternative approach looks at the effect of public aid *expectations* on support for mandatory insurance. This reflects the mechanism via which public aid policies matter in this context: via expectations. With our treatment, we induce exogenous variation in expectations and can therefore deal with the potentially endogenous relationship between aid expectations and views of mandatory insurance.

We employ a Two-Stage Least Squares (2SLS) design: in the first stage, we estimate the effect of the treatment on posterior aid expectations, as discussed in section 5.1. Looking at the continuous measure, we regress the posterior aid expectation as a percentage of damages on the high aid treatment:

$$AidExpPerc_{post,i} = \alpha + \beta_1 * HighAid_i + \epsilon_i, \tag{2}$$

where β_1 is the treatment effect for group 2 individuals.[13]

Table 2: 2SLS, First Stage Regression: Treatment Effects on Posterior Aid Expectations

	Posterior Aid Expectations (in % of Damage)
	(1)
High Aid Treatment	14.80***
	(0.77)
Constant	17.22***
	(0.54)
Observations	5348
R. sq.	0.065

Notes: Results are shown for a linear regression of posterior on prior aid expectations and the high aid treatment dummy. Aid expectations are measured as a continuous variable. Robust standard errors are in parentheses. Significance levels are indicated as * $p < 0.10$,** $p < 0.05$, *** $p < 0.01$.

In the second stage, we use the posteriors estimated in Equation 2 to explain a positive view of mandatory insurance:

$$1(PositiveAssessmentMandatoryInsurance)_i = \alpha + \beta_1 * \widehat{AidExpPerc}_{post,i} + \epsilon_i. \quad (3)$$

Using this approach, we estimate the average treatment effect on the treated (ATT), and we can answer the question how higher public aid expectations change support for mandatory insurance. This result is more generalizable than the ATE, since it does not hinge on the political setting or credibility associated with the specific information treatment we used. Table 3 shows the results. We find that 10 percentage points higher aid expectations lead to a 2.9 percentage points increase in support for mandatory insurance. For interpretation, it is helpful to have in mind that the high aid treatment shifted aid expectations by around 15 percentage points on average.

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[13]In the spirit of Coibion et al. (2023), we also estimate different specifications including both treatments and their interaction with priors, in order to properly account for updating. The results are available upon request. They do not change the main first stage outcome and we therefore opted for the simpler version of the model.

Table 3: Second Stage: Support for Mandatory Insurance

	1[Positive Assessment of Mandatory Insurance]
	(1)
Posterior Aid Expectations (in % of Damage)	0.0029**
	(0.0012)
Observations	5348
First stage F-stat	249.1

Notes: Results are shown for a probit regression of support for mandatory insurance on posterior aid expectations (as measured in the first stage, high aid treatment only). Robust standard errors are in parentheses. Significance levels are indicated as * $p < 0.10,$** $p < 0.05,$ *** $p < 0.01$.

5.4 Mechanisms

The previous section showed that higher aid expectations increase the support for mandatory insurance, which is driven by participants that update their information set regarding public aid beliefs. In what follows, we explore the mechanisms behind the results; all of the estimations are based on the 2SLS approach described above, i.e. already taking information updating into account and focusing on the ATT.

5.4.1 Attitudes towards public aid vs. mandatory insurance

As described in section 4, participants were asked to compare state aid and mandatory insurance along the dimensions of fairness, personal benefit, and social cost. In Table 4, we show the effect of a change in aid expectations on these attitudes. The dependent variable of the second stage regression is a dummy variable equal to 1 if participants assess mandatory insurance as a) having higher costs, b) being fairer, and c) being personally more beneficial than public aid.

Table 4: Second Stage: Attitudes about Mandatory Insurance (Only High Aid Treatment)

	1[Assessment of Mandatory Insurance relative to Public Aid]		
	(1)	(2)	(3)
	Higher Costs	Fairer	Personally more beneficial
Posterior Aid Expectations (in % of Damage)	0.0011	0.0022*	-0.0001
	(0.0011)	(0.0012)	(0.0010)
Observations	5348	5348	5348
First stage F-stat	243.9	243.9	243.9

Notes: Results are shown for a probit estimation. The dependent variable is equal to one if participants assess mandatory insurance as more applicable than aid in the respective category. The independent variable is posterior aid expectations (as measured in the first stage, high aid treatment only). Robust standard errors are in parentheses. Significance levels are indicated as * $p < 0.10,$** $p < 0.05,$ *** $p < 0.01$.

In both direction and size, the assessment of fairness echoes support for mandatory insurance: Higher aid expectations make mandatory insurance seem fairer than public aid. A 10% rise in public aid expectations increases the probability that mandatory insurance is seen as fairer by 2.2 percentage points. By contrast, we do not see a significant adjustment of views regarding personal benefit or social cost. We conclude that fairness concerns are a key mechanism of the treatment effect.

5.4.2 Heterogeneity by flooding area and insurance status

To provide further support on the channels driving the results, we investigate heterogeneous treatment effects. We split participants into four groups: (i) non-insurance holders, not in flooding area, (ii) non-insurance holders, in flooding area, (iii) insurance holders, not in flooding area, (iv) insurance holders, in flooding area. Households are defined to live in a flooding area if they report to remember a flooding event in their municipality during the last 10 years.[14]

Table 5: Heterogeneity by flooding area and insurance status: Second Stage: Support for Mandatory Insurance (only High Aid Treatment)

	1[Positive Assessment of Mandatory Insurance]			
	(1) Not insured, no flooding area	(2) Not insured, flooding area	(3) Insured, no flooding area	(4) Insured, flooding area
Posterior Aid Expectations (in % of Damage)	0.0035**	-0.0021	0.0018	0.0013
	(0.0014)	(0.0030)	(0.0020)	(0.0042)
Observations	1846	479	2070	816
First stage F-stat	112.3	30.0	87.5	14.9
Method	Linear	Linear	Linear	Linear

Notes: Results are shown for probit regressions of support for mandatory insurance on posterior aid expectations (as measured in the first stage, high aid treatment only). Columns indicate estimations run on different subgroups of the sample. Robust standard errors are in parentheses. Significance levels are indicated as * $p < 0.10$,** $p < 0.05$, *** $p < 0.01$.

As shown in Table 5,[15] we find that group (i) is driving the results. This group is generally not supportive of mandatory insurance, but once learning about high public aid, they increase their support. Again, fairness concerns might play an important role.

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[14]While we cannot verify whether participants actually live in a high flood risk area, the information should be a good proxy for the perceived risk of such events. In line with this argument, we find that people reporting a flooding incidence in their municipality during the last 10 years are more worried about future flooding events.

[15]Results for the first stage are shown in Table 9.

Group (ii) actually lowers support for mandatory insurance after learning about high aid, although the effect is imprecisely estimated. These participants are potentially free-riders: Given that they live in a flooding area without having an insurance, they might perceive public aid as personally beneficial vis-à-vis mandatory insurance.

Group (iii) and (iv) tend to show a positive treatment effect, but results are again imprecisely estimated. This group might not react so much to treatment, as they are in general very supportive of mandatory insurance anyway.

6 Conclusion

We survey a representative sample of German households on two alternative policies dealing with flooding events: state aid and mandatory insurance. We find that prior aid expectations (conditional on flood damages) are low. 47% do not expect to receive any aid; on average, participants expect to receive 18% of damages from the state. Households do recognize the trade-offs between the two policies – aid is seen as more in their self-interest, but more costly to society, and less fair. We then randomize information on state aid policies. The *high aid* treatment group receives information about a recent, generous flood aid package, covering up to 80% of losses. In response, the treatment group exhibits a higher support for mandatory insurance, and a larger share of this group assesses mandatory insurance as fairer.

The *low aid* treatment group receives information about recent announcements from German states to cease flood aid. This treatment does not have a measurable effect on support for mandatory insurance. Arguably, given the a priori low aid expectations, this treatment did not move expectations much. Also, we saw that reactions to the *high aid* treatment were largely driven by fairness considerations. Information on stopping flood aid may be less prone to invoke fairness concerns, leading to a muted response.

We also elicit posterior expectations, and apply a 2-stage least squares (2SLS) approach: in the first stage, we measure the shift in aid expectations in response to the treatment; in the second stage, we measure the effect of increased aid expectations on support for mandatory insurance. These results, yielding an Average Treatment Effect on

the Treated (ATT), can be generalized beyond the specific policy setting which we use in the information treatment. We find that an increase in aid expectations by ten percentage points would increase support for mandatory insurance by 3 percentage points. Similarly, the assessment of fairness of mandatory insurance increases by 2.2 percentage points. Looking at heterogeneities, we see that the effects are driven by uninsured households in areas with low flood risk, again pointing to the fairness channel.

These results have implications for the design of public adaptation policies. Ex-post flood aid is popular among politicians, but it is costly and incompatible with incentives. We show that informing voters about high aid payments leads to strong fairness concerns and more support for mandatory insurance. The political feasibility of exiting flood aid may thus have been underestimated in the past. Introducing mandatory insurance or laws banning flood aid can be a useful strategy, if it is accompanied by a a public debate on public and private responsibilities in dealing with climate change.

References

Billings, S. B., Gallagher, E. A., and Ricketts, L. (2022). Let the rich be flooded: the distribution of financial aid and distress after hurricane harvey. *Journal of Financial Economics*.

Chen, J. (2013). Voter partisanship and the effect of distributive spending on political participation. *American Journal of Political Science*, 57(1):200–217.

Coibion, O., Georgarakos, D., Gorodnichenko, Y., and van Rooij, M. (2023). How does consumption respond to news about inflation? field evidence from a randomized control trial. *American Economic Journal: Macroeconomics*, 15(3):109–52.

CRED (2023). *2022 Disasters in numbers*. CRED, Brussels.

D'Acunto, F., Möhrle, S., Neumeier, F., Peichl, A., and Weber, M. (2022). How to finance climate change policies? evidence from consumers' beliefs. *SSRN Electronic Journal*.

Dechezleprêtre, A., Fabre, A., Kruse, T., Planterose, B., Chico, A. S., and Stantcheva, S. (2022). Fighting climate change: International attitudes toward climate policies. Technical report, National Bureau of Economic Research.

GDV (2021). Positionspapier des Gesamtverbandes der Deutschen Versicherungswirtschaft zur Zukunft der Versicherung gegen Naturgefahrenereignisse in Deutschland. *Gesamtverband der Deutschen Versicherungswirtschaft e. V.*

Gross, C., Wagner, G., and Leier, B. (2022). Versicherungspflicht gegen Naturgefahren: Neue Entwicklungen, Verfassungskonformität und Akzeptanz in der Bevölkerung. *Veröffentlichungen des Sachverständigenrats für Verbraucherfragen*.

Groß, C. and Wagner, G. G. (2021). Versicherungspflicht für Elementarschäden. *ifo Schnelldienst*, 74(11):6–10.

Haaland, I., Roth, C., and Wohlfart, J. (2020). Designing information provision experiments.

Healy, A. and Malhotra, N. (2009). Myopic voters and natural disaster policy. *American Political Science Review*, 103(3):387–406.

Kahn, M. E. (2005). The death toll from natural disasters: the role of income, geography, and institutions. *Review of economics and statistics*, 87(2):271–284.

Leeson, P. T. and Sobel, R. S. (2008). Weathering corruption. *The Journal of Law and Economics*, 51(4):667–681.

Michel-Kerjan, E. O. (2010). Catastrophe economics: the national flood insurance program. *Journal of economic perspectives*, 24(4):165–86.

Paleari, S. (2019). Disaster risk insurance: A comparison of national schemes in the eu-28. *International Journal of Disaster Risk Reduction*, 35:101059.

Raschky, P. A. and Weck-Hannemann, H. (2007). Charity hazard—a real hazard to natural disaster insurance? *Environmental Hazards*, 7(4):321–329.

Rentschler, J., Salhab, M., and Jafino, B. A. (2022). Flood exposure and poverty in 188 countries. *Nature communications*, 13(1):3527.

Roth, M. (2021). Ausgestaltung einer verpflichtenden Elementarschadenversicherung. *ifo Schnelldienst*, 74(11):22–25.

Schwarze, R. and Wagner, G. G. (2006). The political economy of natural disaster

insurance: Lessons from the failure of a proposed compulsory insurance scheme in germany. *Technische Universität Berlin, Fakultät Wirtschaft und Management, Berlin.*

Schwarze, R. and Wagner, G. G. (2021). Für einen bezahlbaren Versicherungsschutz gegen Naturgefahren für jedermann,Positionspapier des vzbv zur Versicherbarkeit gegen Elementarschäden an Wohngebäuden. *Verbraucherzentrale Bundesverband e.V.*

Stantcheva, S. (2021). Understanding tax policy: How do people reason? *The Quarterly Journal of Economics*, 136:2309–2369.
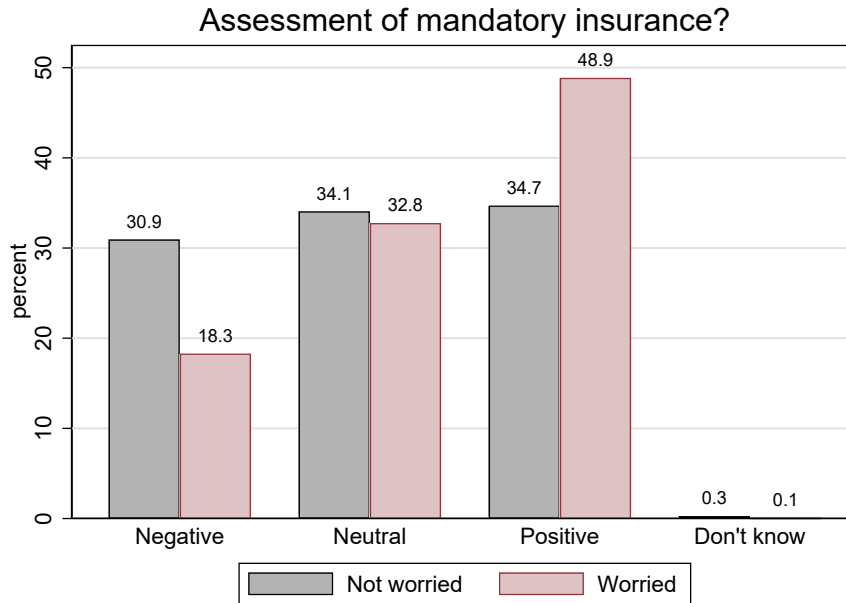
Appendix

A   Additional Figures and Tables

Figure 4: Support for mandatory insurance by insurance status
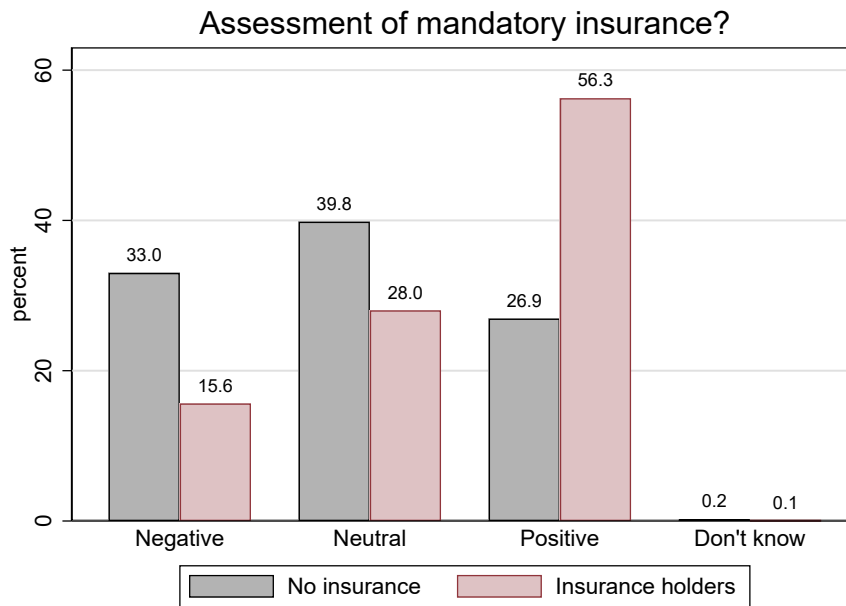
Assessment of mandatory insurance?

Notes: Answers on mandatory insurance originally on a 5-point Likert scale, re-scaled to three categories. Control group only.

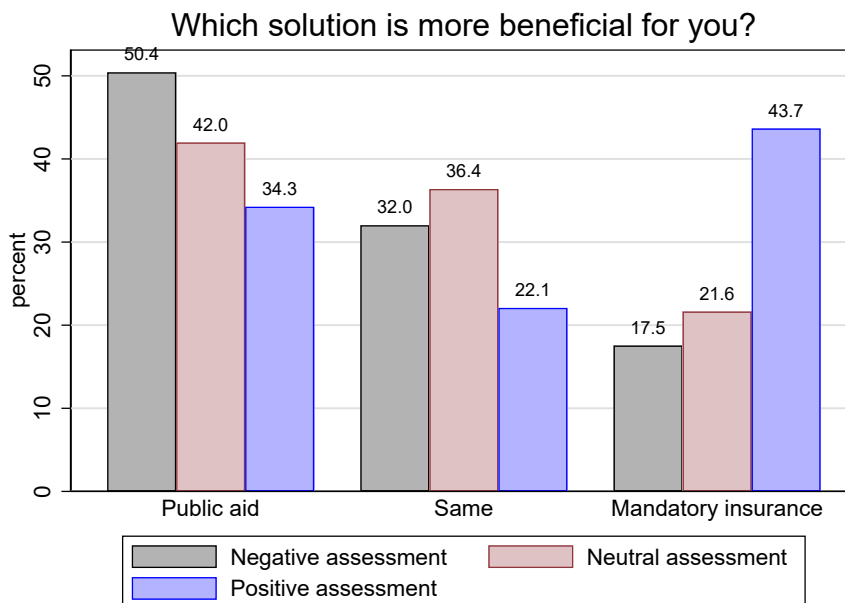Figure 5: Support for mandatory insurance by worries about flooding events

Notes: Answers on mandatory insurance originally on a 5-point Likert scale, re-scaled to three categories. Worry about flooding events originally on a 4-point scale, re-scaled to two categories. Control group only.

Table 6: Balancing test across treatment groups

	Treatments		
	T1: Control Group	T2: High Aid Treatment	T3: Low Aid Treatment
1[Female]	0.47	0.45	0.46
	(0.50)	(0.50)	(0.50)
Age	55.37	54.62	55.04
	(15.73)	(15.72)	(16.09)
1[Higher secondary degree]	0.47	0.47	0.45
	(0.50)	(0.50)	(0.50)
1[Eastern Germany]	0.14	0.14	0.14
	(0.35)	(0.35)	(0.35)
1[Hold insurance]	0.55	0.55	0.55
	(0.50)	(0.50)	(0.50)
1[Municipality affected by flooding during last 10 years]	0.26	0.24	0.24
	(0.44)	(0.43)	(0.43)
Prior Expected Aid in %	18.00	18.74	18.49
	(24.27)	(24.19)	(24.05)

Figure 6: Disagreement by supporters vs. non-supporters of MI: Which solution is more beneficial for you?

Which solution is more beneficial for you?

Notes: Answers on mandatory insurance and more beneficial solution originally on a 5-point Likert scale, re-scaled to three categories. Control group only.

Figure 7: Disagreement by supporters vs. non-supporters of MI: Which solution is fairer?
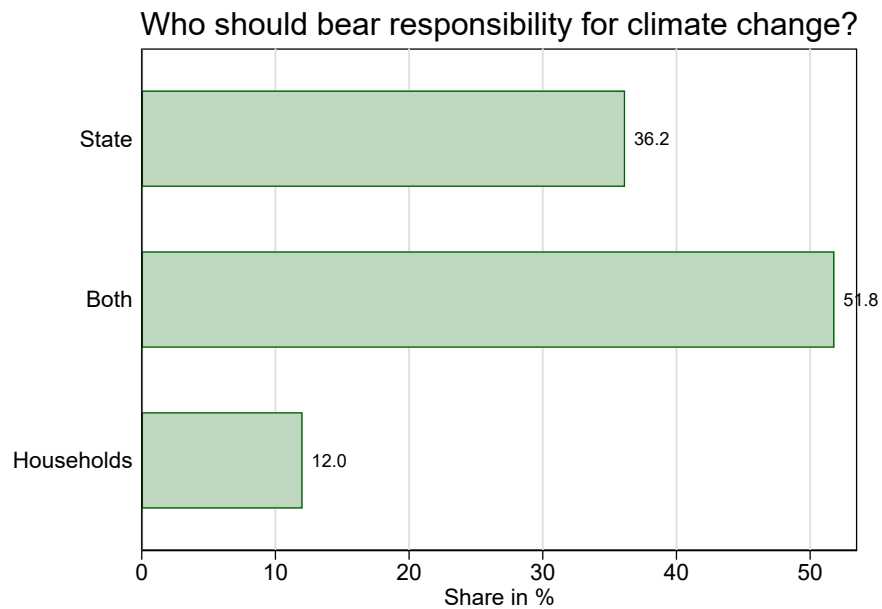

Which solution is fairer?
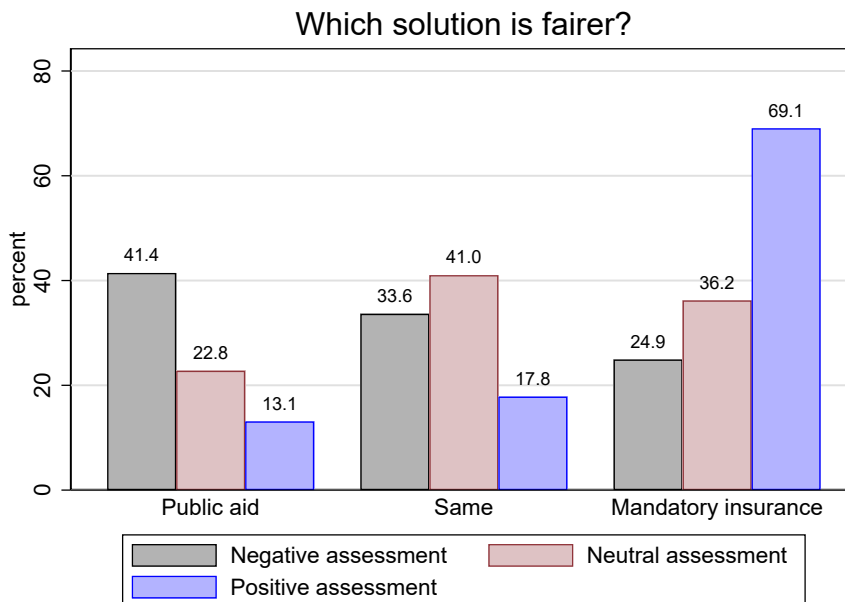
Notes: Answers on mandatory insurance and fairer solution originally on a 5-point Likert scale, re-scaled to three categories. Control group only.

Figure 8: Who should be responsible for flooding events?
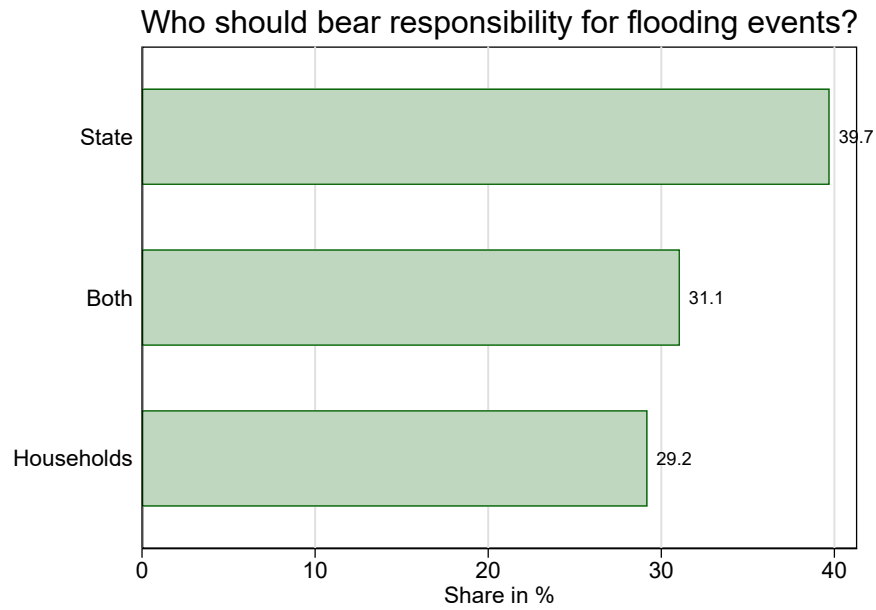
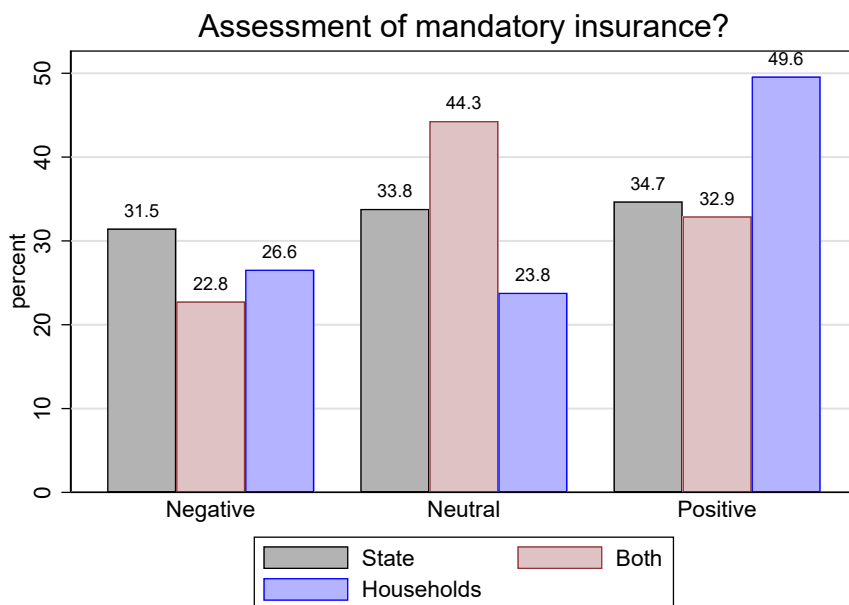**Who should bear responsibility for flooding events?**

Notes: Answers originally on a 5-point scale, re-scaled to three categories. Control group only.

Figure 9: Who should be responsible for mitigating climate change?

**Who should bear responsibility for climate change?**

Notes: Answers originally on a 5-point scale, re-scaled to three categories. Control group only.

Figure 10: Support for Mandatory Insurance: Heterogeneity by question: "Who should be responsible for flooding events?"


Notes: Answers originally on a 5-point scale, re-scaled to three categories. Control group only.

Figure 11: Prior expectations about public aid: Continuous measure
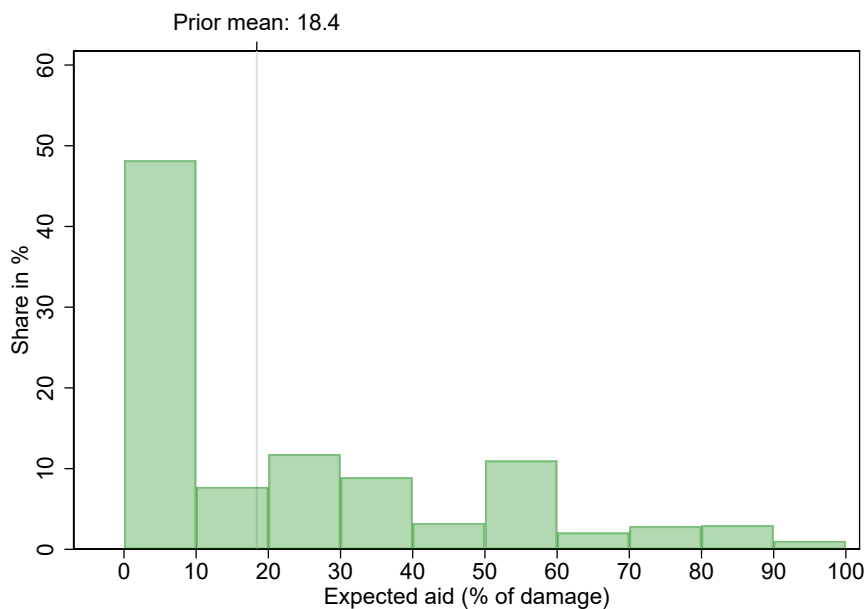
Notes: This graph shows the distribution of prior aid expectations (continuous measure). Households not expecting aid are equivalent to 0% aid expectations.

Figure 12: Group 1 posterior vs. prior (continuous measure)
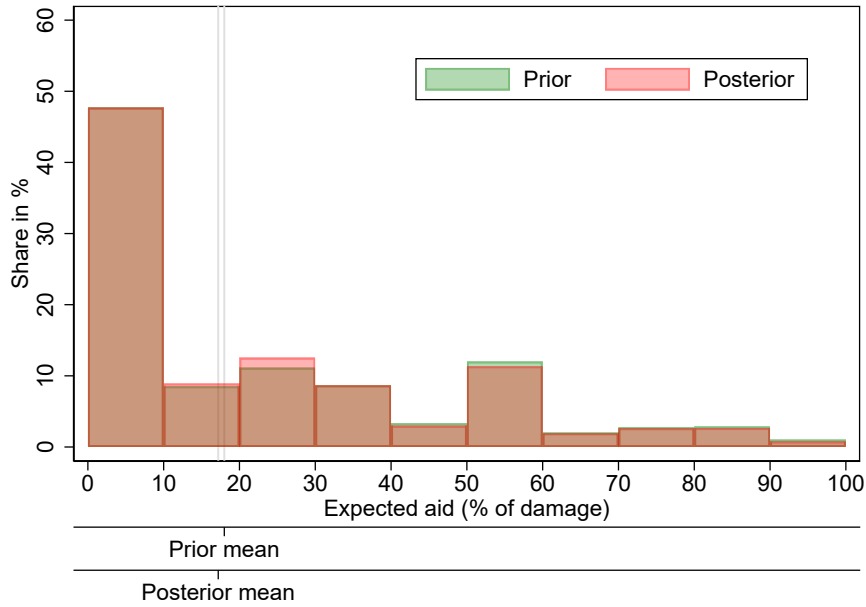
Notes: This graph shows the distribution of priors and posteriors in the control group (treatment group 1). Households not expecting aid are equivalent to 0% aid expectations.

Table 7: Treatment Effects on Posterior Aid Expectations

	Posterior Aid Expectations (in % of Damage)
	(1)
High Aid Treatment	14.80***
	(0.72)
Low Aid Treatment	-4.00***
	(0.71)
Constant	17.22***
	(0.51)
Observations	8017
R. sq.	0.088

Notes: Results are shown for a regression of posterior on prior aid expectations and treatment dummies. Aid expectations are measured as a continuous variable. Linear estimation. Robust standard errors are in parentheses. Significance levels are indicated as * $p < 0.10$,** $p < 0.05$, *** $p < 0.01$.

Figure 13: Treatment Effects on Support for Mandatory Insurance - 5 Outcomes
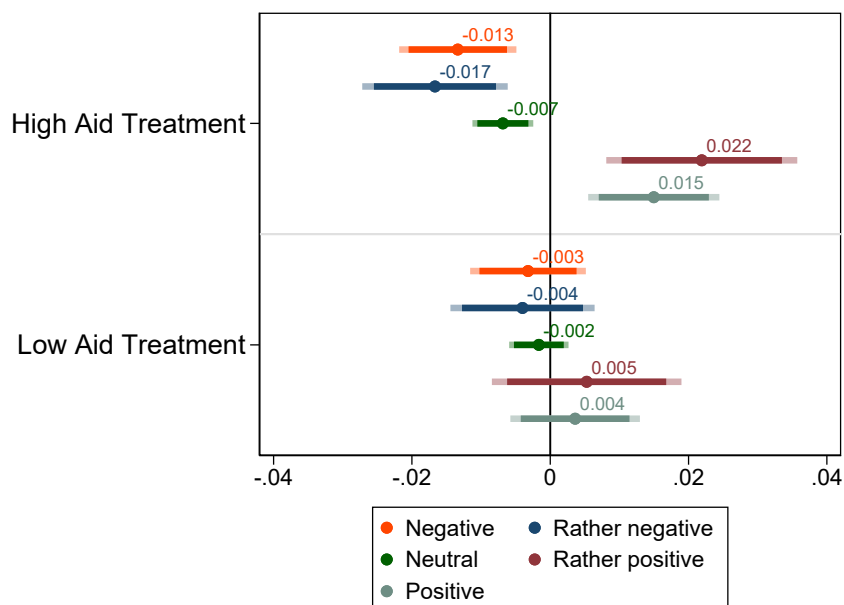
Notes: This figure shows the average treatment effect (ATE) of information on state aid on opinions on mandatory insurance (measured on a 5-outcome scale), based on ordered logit estimation. Benchmark model: no controls, weighted. Non-shaded and shaded areas indicate the 90% and 95% confidence intervals, respectively.

Table 8: Regression Results for Robustness: Support for Mandatory Insurance (2 Outcomes, Probit Model)

	1[Positive Assessment of Mandatory Insurance]		
	(1)	(2)	(3)
High Aid Treatment	0.0423**	0.0408**	0.0262*
	(0.0165)	(0.0165)	(0.0136)
Low Aid Treatment	0.0123	0.0095	0.0121
	(0.0166)	(0.0167)	(0.0136)
Observations	8017	8017	8017
Controls	No	Yes	No
Weighted Regressions	Yes	Yes	No

Notes: Probit estimation. Robust standard errors are in parentheses. Significance levels are indicated as * $p < 0.10$,** $p < 0.05$, *** $p < 0.01$.

Table 9: Heterogeneity by flooding area and insurance status: Treatment Effects on Posterior Aid Expectations: Simple specification, continous aid measure, only 2 groups

	Posterior Aid Expectations (in % of Damage)			
	(1) Not insured, no flooding area	(2) Not insured, flooding area	(3) Insured, no flooding area	(4) Insured, flooding area
High Aid Treatment	18.17***	16.91***	13.39***	9.95***
	(1.33)	(2.57)	(1.21)	(1.99)
Constant	17.77***	17.06***	17.22***	17.89***
	(0.93)	(1.82)	(0.87)	(1.39)
Observations	1855	482	2083	820
R. sq.	0.092	0.082	0.056	0.030

Notes: Linear estimation. Robust standard errors are in parentheses. Significance levels are indicated as * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B Proposals for mandatory flood insurance in Germany

The severe consequences of the July 2021 floods in Germany reinvigorated the political debate regarding a mandatory natural hazard insurance, the introduction of which had failed in 2003/2004. At that point, a mandatory insurance was not only seen as unconstitutional but also the state was not willing to provide the level of guarantee demanded by the German insurance companies (Schwarze and Wagner, 2006).

Within the renewed debate in 2021, the Advisory Council for Consumer Affairs (SVRV), the German Insurance Association (GDV) as well as the Federation of German Consumer Organisations (vzbv) published relevant reform proposals for the natural hazard insurance in Germany. While these three proposals agree that an increased natural hazard insurance uptake is desirable, there is great controversy as to whether this implies the introduction of a mandatory insurance (Gross et al., 2022).

The SVRV positions itself clearly in favor of a mandatory insurance. The proposal applies a fairly high deductible by taking 25,000 Euros as a guideline. However, in an optional better or full insurance the deductible could be reduced or set to zero (Gross et al., 2022). The SVRV also considers targeted subsidies for low-income houseowners (Groß and Wagner, 2021). Gross et al. (2022) estimate that through the mandatory insurance, the market premium would be lower than today's market premiums for residential building insurance with the additional natural hazard insurance.

In contrast to this, the vzbv proposes a two-stage model. In the first stage, the current residential building insurance would be reformed to have an all risk coverage. Basically, this stage eliminates the option to have a residential building insurance without insurance of natural hazard. If the insurance density is less than 80 percent after two years, the second stage comes into effect, which introduces a mandatory insurance for consumers but not for commercial landlords such as real estate companies (Schwarze and Wagner, 2021). Opposed to SVRV's proposal, the vzbv prefers low deductibles and opposes mandatory deductibles. Deductibles could, however, be agreed individually within a framework set by the law. However, in the light of low deductibles as well as an all risk coverage, premiums are expected to be higher than in the status quo (Schwarze and Wagner, 2021).

Finally, the GDV opposes any form of mandatory insurance but wants to change the current opt-in model to an opt-out model for natural hazard insurance based on the argument that it is the responsibility of all stakeholders, such as the insurance industry or public authorities, to inform and convince property owners of the benefits (GDV, 2021).

C Survey and Treatments

C.1 Survey in German (original version)

Einleitungstext: Im Folgenden möchten wir Ihnen gerne einige Fragen zu Starkregen und Überschwemmungen stellen. Uns interessiert, wie sich Haushalte auf solche extremen Wetterereignisse vorbereiten.

Q1: Laut Umweltbundesamt hat der Klimawandel weitreichende Folgen für Deutschland. Beispielweise werden durch den Klimawandel Extremwetterereignisse wie Starkregen mit Überschwemmungen ebenso wie Hitzewellen und Waldbrände in Deutschland wahrscheinlicher. Wie groß ist Ihre Sorge, dass Ihr Haus / Ihre Wohnung / Ihr Hausrat in den kommenden 10 Jahren von einer Überschwemmung aufgrund von Starkregen betroffen sein könnte?

- Keine Sorge
- Etwas Sorge
- Große Sorge
- Sehr große Sorge

Q2: Wie Sie vielleicht wissen, kam es im Juli in Teilen von Nordrhein-Westfalen, Rheinland-Pfalz und Bayern zu schweren Überschwemmungen infolge von Starkregen. Stellen Sie sich vor, Ihre Region erlebt nächstes Jahr ähnliche Überschwemmungen. Auch Ihr Eigentum ist schwer von den Überschwemmungen betroffen und es entstehen hohe Schäden an Gebäude, Hausrat, Pkws etc. Denken Sie, dass Sie der Staat in diesem Fall finanziell unterstützen würde?

- Ja
- Nein
- Ich würde keine staatliche Unterstützung annehmen

Q3 (falls Ja bei Q2): Was denken Sie: wieviel finanzielle Hilfe würde der Staat in diesem Fall leisten, ausgedrückt als prozentualer Anteil der Schäden an Ihrem Haus / Ihrer Wohnung / Ihrem Hausrat / Ihrem Pkw?
Prog.: Wenn Wert außerhalb 1-100%, dann „Bitte geben Sie einen Wert zwischen 1 und 100% ein" einblenden.

- Anteil in % der Schadensumme
- Weiß nicht

Informationsexperiment
Programmierung: Bitte die Befragten zufällig in 3 (gleich große) Gruppen einteilen. Gruppe 1 bekommt das zugehörige Infotreatment und beantwortet Fragen Z1 und springt dann zu Frage Q6. Gruppe 2 bekommt das dazugehörige Infotreatment und beantwortet Frage Q4 und springt dann zu Q6; Gruppe 3 bekommt das dazugehörige Infotreatment und beantwortet Frage Q5 und springt dann zu Q6. Außerdem soll die entsprechende

Information für Gruppen 1, 2 und 3 mindestens für 20 Sekunden auf dem Bildschirm zu sehen sein.

Gruppe 1: Laut Vereinten Nationen waren 71 Prozent aller Naturkatastrophen der vergangenen 20 Jahre Überschwemmungen oder Stürme.

Gruppe 1 beantwortet Frage Z1

Z1: War Ihnen die Information bekannt, dass 71 Prozent aller Naturkatastrophen der vergangenen 20 Jahre Überschwemmungen oder Stürme waren?

- Ja
- Nein

Gruppe 2: Bund und Länder haben sich darauf geeinigt, die von den Überschwemmungen im Juli betroffenen Regionen finanziell zu unterstützen. Privathaushalte und Unternehmen sollen dabei Schäden ersetzt bekommen, die nicht durch eine Versicherung gedeckt sind. Die Zuwendungen sollen bis zu 80% der Schadenssumme betragen.

Gruppe 2 beantwortet Frage Q4

Q4: War Ihnen die Information bekannt, dass der Staat den Haushalten, die im Juli Opfer von Überschwemmungen wurden, bis zu 80% der Schäden ersetzen wird?

- Ja
- Nein

Gruppe 3: In den vergangenen Jahren haben einige Bundesländer angekündigt, im Fall von Extremwetterereignissen und anderen Naturkatastrophen keine Finanzhilfen mehr an die Geschädigten zu zahlen. Ausnahmen soll es nur dann geben, wenn die Schäden ein existenzbedrohendes Ausmaß annehmen.

Gruppe 3 beantwortet Frage Q5

Q5: War Ihnen die Information bekannt, dass einige Bundesländer angekündigt haben, keine Finanzhilfen mehr an Geschädigte von Extremwetterereignissen und andere Naturkatastrophen zu zahlen?

- Ja
- Nein

Q6: Haushalte und Unternehmen können sich gegen Schäden, die durch Extremwetterereignisse und andere Naturkatastrophen (z.B. Starkregen, Hochwasser, Erdrutsch) entstehen, durch Abschluss einer Elementarschadenversicherung versichern. Eine Elementarschadenversicherung deckt Kosten ab, die durch Sachschäden am Gebäude oder Hausrat aufgrund von Extremwetterereignissen verursacht wurden. Haben Sie eine Elementarschadenversicherung abgeschlossen (zum Beispiel als Teil einer Sachschaden-, Hausrat- oder Gebäudeversicherung)?

- Ja

- Nein
- Weiß nicht

Q7 [Falls Q6 = Ja]: Wie hoch sind die jährlichen Kosten für die Elementarschaden-versicherung Ihres Haushalts in etwa?
Prog.: Wenn Wert außerhalb 0 – 10.000 Euro, dann „Bitte geben Sie einen Wert zwischen 0 und 10.000 Euro ein" einblenden.

- Kosten in Euro pro Jahr [Eingaben zwischen 0 und 10.000 Euro möglich]
- Weiß nicht

Q8 [Falls Q6 = Ja]: Wie viel wären Sie maximal bereit, für eine Elementarschadenver-sicherung jährlich zu bezahlen? Anmerkung: Wenn eine Elementarschadensversicherung für Sie nicht in Frage kommt, geben Sie bitte einen Wert von 0 Euro an.
Prog.: Wenn Wert außerhalb 0 – 10.000 Euro, dann „Bitte geben Sie einen Wert zwischen 0 und 10.000 Euro ein" einblenden.

- Euro pro Jahr [Werte zwischen 0 und 10.000 Euro möglich]

Q9 [Falls Q6 = Nein]: Wären Sie bereit, eine Elementarschadenversicherung abzuschließen? Falls ja, wie viel wären Sie maximal bereit dafür jährlich zu bezahlen? Anmerkung: Wenn eine Elementarschadensversicherung für Sie nicht in Frage kommt, geben Sie bitte einen Wert von 0 Euro an.
Prog.: Wenn Wert außerhalb 0 – 10.000 Euro, dann „Bitte geben Sie einen Wert zwischen 0 und 10.000 Euro ein" einblenden.

- Euro pro Jahr [Werte zwischen 0 und 10.000 Euro möglich]

Q10: Für wie wahrscheinlich halten Sie es, dass der Staat in den nächsten 5 Jahren für Haushalte eine Pflichtversicherung für Elementarschäden wie Überschwemmungen einführt? Hinweis: Eine Pflichtversicherung für Elementarschäden hätte zur Folge, dass jeder Hauseigentümer sich gegen Überschwemmungen versichern muss. (Ähnliches gilt in Deutschland z.B. bei der KfZ-Haftpflicht-Versicherung). Hauseigentümer in Überschwemmungsrisikogebieten würden dabei höhere Prämien zahlen müssen. Diese Prämien können dann auf die Mieter umgelegt werden.

- Sehr unwahrscheinlich
- Eher unwahrscheinlich
- 50-50
- Eher wahrscheinlich
- Sehr wahrscheinlich

Q11: Wie würden Sie eine Versicherungspflicht für Elementarschäden bewerten?

- Negativ
- Eher negativ

- Neutral
- Eher positiv
- Positiv

Q12: Erlauben Sie uns, die Frage zur Staatshilfe nach Überschwemmungen nochmals zu stellen. Stellen Sie sich noch einmal vor, ihre Region erlebt nächstes Jahr ähnliche Überschwemmungen, wie sie sich im Juli in Nordrhein-Westfalen, Rheinland-Pfalz und Bayern ereignet haben. Auch Ihr Eigentum ist schwer von den Überschwemmungen betroffen und es entstehen hohe Schäden an Gebäude, Hausrat, Pkws etc. Denken Sie, dass Sie der Staat in diesem Fall finanziell unterstützen würde?

- Ja
- Nein
- Ich würde keine staatliche Unterstützung annehmen

Q13: [Falls Ja bei Q12] Was denken Sie: wieviel finanzielle Hilfe würde der Staat in diesem Fall leisten, ausgedrückt als prozentualer Anteil der Schäden an Ihrem Haus / Ihrer Wohnung / Ihrem Hausrat / Ihrem Pkw? Prog.: Wenn Wert außerhalb 1-100%, dann „Bitte geben Sie einen Wert zwischen 0 und 100 ein" einblenden.

- Anteil in % der Schadensumme
- Weiß nicht

Q14: War Ihre Gemeinde in den letzten 10 Jahren von einer Überschwemmung aufgrund von Starkregen betroffen?

- Ja
- Nein
- Weiß nicht

Q15: [Falls Q14 = ja] Die Überschwemmung hatte folgende Auswirkung auf meinen Haushalt: - Stark negative Auswirkung - Negative Auswirkung - Keine Auswirkung - Weiß nicht Q16 [Falls Frage Q15= Auswirkung negativ oder stark negativ] Mein Haushalt

a) war gegen Elementarschäden versichert. b) hat Hilfe vom Staat bekommen.

- Ja
- Nein
- Weiß nicht

Q17: Bitte schätzen Sie: Welcher Anteil der Haushalte in ihrem Landkreis hat eine Elementarschadenversicherung abgeschlossen, die bei Schäden an Gebäude oder Hausrat greift? Prog.: Wenn Wert außerhalb 0-100

- Anteil in % [Werte zwischen 0 und 100%]
- Weiß nicht

Q18: Bitte bewerten Sie die folgenden Aussagen zum Thema Staat und Privathaushalte auf einer Skala von -2 bis +2, wobei -2 bedeutet „der Staat sollte die volle Verantwortung tragen" und +2 „Privathaushalte sollten die volle Verantwortung tragen":

a) Wer sollte die Verantwortung für den Klimaschutz tragen?

- -2 (Der Staat sollte die volle Verantwortung tragen für den Klimaschutz)
- -1
- 0
- +1
- +2 (Haushalte sollten die volle Verantwortung tragen für den Klimaschutz)

b) Wer sollte die Verantwortung für Überschwemmungen tragen?

- -2 (Der Staat sollte von Überschwemmungen betroffene Haushalte unterstützen)
- -1
- 0
- +1
- +2 (Haushalte sollten sich selbst gegen Überschwemmungen absichern)

Z2: Der Staat kann gegen die Folgen von Überschwemmungen unterschiedliche Maßnahmen ergreifen. Er kann selbst Finanzhilfen an die Geschädigten zahlen, oder aber Haushalte dazu verpflichten, sich gegen Schäden zu versichern. Welche Maßnahme ist Ihrer Meinung nach mit höheren Kosten für die Allgemeinheit verbunden?

- -2 (Staatliche Hilfen für die Geschädigten)
- -1
- 0
- +1
- +2 (Eine Versicherungspflicht)

Z3: Und welche Maßnahme ist Ihrer Meinung nach gerechter?

- -2 (Staatliche Hilfen für die Geschädigten)
- -1
- 0
- +1
- +2 (Eine Versicherungspflicht)

Z4: Und welche Maßnahme ist für Sie persönlich finanziell vorteilhafter?

- -2 (Staatliche Hilfen für die Geschädigten)
- -1
- 0
- +1
- +2 (Eine Versicherungspflicht)

Q19: Wir möchten Ihnen noch eine Frage zu Ihrem Haushalt stellen, bei der es nicht direkt um Überschwemmungsrisiken geht: Angenommen, Sie müssten plötzlich eine zusätzliche Ausgabe tätigen, die der Höhe des monatlichen Nettoeinkommens Ihres Haushalts entspricht. Hätten Sie die Möglichkeit, eine solche Ausgabe durch eigene Ersparnisse zu finanzieren?

- Ja
- Nein
- Weiß nicht/ keine Angabe

Z5: Wie hoch, glauben Sie, ist die Wahrscheinlichkeit, dass es in den nächsten Jahren zu Steuererhöhungen kommen wird? Bitte geben Sie Ihre Einschätzung zwischen 0% (absolut unwahrscheinlich) und 100% (absolut sicher). Wie hoch ist die Wahrscheinlichkeit, dass a) für Sie persönlich die Steuern erhöht werden? b) Es allgemein in Deutschland zu Steuererhöhungen kommen wird?
Prog.: Optisch durch Schieberegler o.ä. unterstützen.

- ANGABE PROZENT (Prog.: Werte von 0 bis 100 zulässig)
- Weiß nicht / keine Angabe

Q20: Wohnen Sie zur Miete?

- Ja
- Nein, die Immobilie gehört mir/ einem Haushaltsmitglied
- Nein, die Immobilie gehört keinem Haushaltsmitglied, ich/wir wohnen jedoch mietfrei
- Keine Angabe

Q21: In welchem Haustyp wohnen Sie?

- freistehendes Ein-/Zweifamilienhaus
- Ein-/Zweifamilienhaus als Reihenhaus oder Doppelhaus
- Wohnhaus mit 3 bis 4 Wohnungen
- Wohnhaus mit 5 bis 8 Wohnungen
- Wohnhaus mit 9 oder mehr Wohnungen (aber höchstens 8 Stockwerken, also kein Hochhaus)
- Hochhaus (9 oder mehr Stockwerke)
- Sonstiges
- Keine Angabe

Q22: [Falls Q21 = Wohnhaus, Hochhaus oder Sonstiges] Bewohnen Sie Räumlichkeiten im Erdgeschoss, Souterrain oder Keller?

- Ja
- Nein
- Keine Angabe

Q23 [Wenn Gruppe 2]: Im Lauf dieser Umfrage wurde erwähnt, dass der Staat den Opfern der Flut vom letzten Sommer einen Anteil der Schäden ersetzt. Können Sie sich noch erinnern, wieviel Prozent es waren?

- 0%
- 40%
- 80%
- 100%
- Weiß nicht/ kann mich nicht erinnern

Q24 [Wenn Gruppe 3]: Im Lauf dieser Umfrage wurde erwähnt, dass einige Bundesländer ihre Politik im Fall von Extremwetterereignissen ändern wollen. Können Sie sich daran noch erinnern? Bitte ergänzen Sie den folgen Satz: "In den vergangenen Jahren haben einige Bundesländer angekündigt, im Fall von Extremwetterereignissen und andere Naturkatastrophen ...."

- mehr Finanzhilfen an die Geschädigten zu zahlen.
- etwas weniger Finanzhilfen an die Geschädigten zu zahlen.
- keine Finanzhilfen mehr an die Geschädigten zu zahlen.
- Weiß nicht / kann mich nicht mehr erinnern.

C.2 Survey in English (translated version)

Introductory text: In the following, we would like to ask you some questions about heavy rain and flooding. We are interested in how households prepare for such extreme weather events.

Q1: According to the Federal Environment Agency, climate change has far-reaching consequences for Germany. For example, extreme weather events such as heavy rainfall with flooding as well as heat waves and forest fires will become more likely in Germany due to climate change. How concerned are you that your house / apartment / household goods could be affected by flooding due to heavy rain in the next 10 years?

- No concern
- Some concern
- Great concern
- Very big concern

Q2: As you may know, parts of North Rhine-Westphalia, Rhineland-Palatinate, and Bavaria experienced severe flooding in July as a consequence of heavy rain. Imagine your region experiences similar flooding next year. As a result, your property is severely affected by the floods, causing high damage to buildings, household goods, cars, etc. Do you think that the state would assist you financially in this case?

- Yes
- No
- I would not accept government assistance.

Q3 (if "Yes" in Q2): What do you think: how much financial help would the state provide in this case, expressed as a percentage of the damage to your house / apartment / household goods / car?

- Share of the amount in percent: %
- Do not know

Information Experiment
Programming: In an information experiment, the respondents are divided randomly into 3 (equally sized) groups. Group 1 gets the associated info treatment and answers question Z1 and then jumps to question B6. Group 2 gets the corresponding info treatment and answers question Q4 and then jumps toQB6; Group 3 gets the corresponding info treatment and answers question Q5 and then jumps to Q6.

The following information text is shown to group 1:
Group 1: According to the United Nations, 71 percent of all natural disasters over the past 20 years have been floods or storms.

Group 1 answers question Z1:
Z1 : Did you know that 71 percent of all natural disasters in the past 20 years were floods or storms?

- Yes
- No

The following information text is shown to group 2:

Group 2: The federal and state governments have agreed to provide financial support to the regions affected by the floods in July. Private households and businesses are to receive compensation for damage not covered by insurance. The grants are to amount to up to 80% of the damage.

Group 2 answers question Q4:

Q4: Did you know that the state will reimburse households that were victims of flooding in July for up to 80% of the damages?

- Yes
- No

The following information text is shown to group 3: **Group 3: In recent years, some German states have announced that they will no longer pay financial aid to victims of extreme weather events and other natural disasters. Exceptions are only to be made if the damage is of an existence-threatening magnitude.**

Group 3 answers question Q5:

Q5: Did you know that some federal states have announced that they will no longer pay financial aid to victims of extreme weather events and other natural disasters?

- Yes
- No

Q6: Households and businesses can insure themselves against damage caused by extreme weather events and other natural disasters (e.g. heavy rain, floods, landslides) by taking out natural hazard insurance. Natural hazard insurance covers costs caused by property damage to the building or household contents due to extreme weather events. Have you taken out natural hazard insurance (for example, as part of an insurance for property damage, household contents or buildings)?

- Yes
- No
- Don't know

Q7 (if "Yes" in Q6): What is the approximate annual cost of your household's natural hazard insurance?

- Costs in Euro per year (Indicate a value between 0 and 10.000 Euro)
- Do not know

Q8 (if "Yes" in Q6): What is the maximum amount you would be willing to pay annually for natural hazard insurance?

- Euro per year (Indicate a value between 0 and 10.000 Euro)
- Do not know

Q9 (if "No" or "Don't know" in Q6): Would you be willing to take out insurance against natural hazards? If so, what is the maximum amount you would be willing to pay for it annually? If natural hazard insurance is not an option for you, please enter a value of 0Euro.

- Euro per year (Indicate a value between 0 and 10.000 Euro)
- Do not know

Q10: How likely do you think it is that the government will introduce mandatory insurance for households for natural hazards such as flooding in the next 5 years? Note: Compulsory natural hazard insurance would mean that every homeowner would have to insure against floods. (A similar situation applies in Germany, e.g., for motor vehicle liability insurance). Homeowners in flood risk areas would have to pay higher premiums. These premiums can then be passed on to tenants.

- Very unlikely
- Rather unlikely
- 50:50
- Rather likely
- Very likely

Q11: How would you evaluate a compulsory natural hazard insurance?

- Negative
- Rather negative
- Neutral
- Rather positive
- Positive

Q12: Allow us to ask the question about state aid after floods again. Imagine again that next year your region experiences floods similar to those that occurred in July in North Rhine-Westphalia, Rhineland-Palatinate and Bavaria. As a result, your property is severely affected by the floods, causing high damage to buildings, household goods, cars, etc. Do you think that the state would assist you financially in this case?

- Yes
- No
- I would not accept government assistance.

Q13 (if "Yes" in Q12): What do you think: how much financial help would the state provide in this case, expressed as a percentage of the damage to your house / apartment / household goods / car?

- Share of the amount in percent: %

- Don't know

Q14: Has your municipality been affected by flooding due to heavy rain in the last 10 years?

- Yes
- No
- Don't know

Q15 (if "Yes" in Q14): How severely did the flood affect your household?

- Strong negative impact
- Negative impact
- No impact
- Do not know

Q16 (if "strong negative impact" or "negative impact" in Q15): My household ...
a) was insured against natural hazards.
b) received help from the state.

- Yes
- No
- Don't know

Q17 Please estimate: What percentage of households in your county have natural hazards insurance that covers damage to buildings or household goods?

- Share in percent: % (Indicate a number between 0 and 100)
- Don't know

Q18: Please rate the following statements about government and private households on a scale from -2 to +2, where -2 means "government should bear full responsibility" and +2 means "private households should bear full responsibility."
a) Who should bear the responsibility for climate protection?

- -2 (The government should bear full responsibility for climate protection)
- -1
- 0
- +1
- +2 (Households should bear full responsibility for climate protection)

b) Who should bear the responsibility for flooding events?

- -2 (The government should support households affected by floods)
- -1
- 0
- +1

- +2 (Private households should protect themselves against flooding events)

Z2: The state can take various measures to counter the consequences of floods. It can pay public aid directly to the victims, or it can oblige households to insure themselves against damage. In your opinion, which measure involves higher costs for the general public?

- -2 (Public aid)
- -1
- 0
- +1
- +2 (Mandatory insurance)

Z3: And which measure do you think is more just?

- -2 (Public aid)
- -1
- 0
- +1
- +2 (Mandatory insurance)

Z4: And which measure is more financially advantageous for you personally?

- -2 (Public aid)
- -1
- 0
- +1
- +2 (Mandatory insurance)

Z5: How likely do you think it is that there will be tax increases in the next few years? Please give your estimate between 0% (absolutely unlikely) and 100 % (absolutely certain). What is the probability that...

- taxes will be increased for you personally?
- there will be tax increases in Germany in general?

Q20: Do you live for rent?

- Yes
- No, the property belongs to me/ a household member
- No, the property does not belong to any household member, but I/we live rent-free
- Not specified

Q21: What type of house do you live in?

- detached one/two family house
- one/two family house as row house or semi-detached house
- apartment house with 3 to 4 apartments
- apartment house with 5 to 8 apartments
- Residential building with 9 or more apartments (but no more than 8 floors, i.e. not a high-rise building)
- High-rise building (9 or more floors)
- Other type
- Not specified

Q22: If you live in a residential or high-rise building or indicates "other type" in Q 21, do you reside on the first floor, basement, or cellar?

- Yes
- No
- Don't know

Group 2 answers the following question:

Q23: In the course of this survey, it was mentioned that the state reimburses the victims of last summer's flood a percentage of the damages. Can you remember what percentage it was?

- 0%
- 40%
- 80%
- 100%
- Do not know / Cannot remember

Group 3 answers the following question:

Q24: In the course of this survey, it was mentioned that some states want to change their policies in case of extreme weather events. Do you still remember this? Please complete the following sentence:

"In recent years, a number of states have announced plans ... in the event of extreme weather events and other natural disasters."

- . . . to pay more financial aid to the injured parties. . .
- to pay slightly less financial aid to the injured parties. . .
- . . . not to pay any more grants to the aggrieved parties. . .
- Don't know / cannot remember.