What incentives can spur Covid-19 vaccination uptake?

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Survey evidence suggests that vaccination hesitancy is too high in many countries to achieve herd immunity against Covid-19. In this study, we assess the effectiveness of three strategies to increase vaccine uptake, namely, providing freedoms, financial remuneration, and vaccination at local doctors. We use a factorial survey experiment administered to 20,500 online respondents in Germany. Our results suggest that all three strategies can increase vaccination uptake on the order of 5 percentage points (PP) among the undecided. The combined effects could be as high as 13 PP for this group. The returns from different strategies vary across age groups, however, with older cohorts more responsive to local access and younger cohorts most responsive to enhanced freedoms for vaccinated citizens.

Introduction

Vaccination is the most important instrument to sustainably contain the COVID-19 pandemic.[1] In an unprecedented worldwide effort, a number of vaccines have been successfully developed in record time. However, in order to stop the spread of the virus, it is important that sufficient numbers are willing to get vaccinated. While it is estimated that about 60-70% of the population needs to be vaccinated to stop the pandemic,[1,2] recent survey evidence suggests that this threshold cannot be met in many countries.[3,4] In a representative public opinion survey conducted in 19 countries, only 55% of the respondents in Russia, 56% of the respondents in Poland and 59% of surveyed citizens in France for instance indicate that they are willing to get vaccinated against COVID-19.[3] The recent decision of many governments to temporarily suspend (e.g. Germany, Canada, India), restrict the use to certain age groups (e.g. Netherlands, United Kingdom, Australia) or even permanently stop the use (e.g. Denmark) of the AstraZeneca vaccine because of possible clotting risks has certainly not helped to convince citizens to get vaccinated against COVID-19. Since a consensus has emerged in most countries that compulsory vaccination is not an option due to fundamental civil rights, the question is how to convince citizens to participate in the vaccination programme. Decision-makers around the world therefore currently debate which strategies can be employed in order to increase vaccination uptake. In this study, we contribute to this discussion by evaluating the effectiveness of three different strategies that governments can adopt to increase the vaccination uptake and identifying for which kinds of populations different approaches are more effective.

While vaccination hesitancy is a major challenge in the fight against the Covid-19 pandemic, there is still limited research on this topic. A number of studies shed light on the level

[1]Research for this contribution is part of the Cluster of Excellence "Contestations of the Liberal Script" (EXC 2055, Project-ID: 390715649), funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany´s Excellence Strategy. We thank Anselm Hager and Lukas Stoetzer for providing valuable comments and suggestions.

of vaccination hesitancy across countries[3–5] and how misinformation affects vaccine hesitancy.[6] Previous studies investigating strategies designed to reduce vaccination hesitancy primarily focused on the effect of information campaigns and political messages, while research on other policy instruments is sparse.[7–9] Early experimental studies conducted in a purely hypothetical setting before vaccines were available arrived at mixed results.[7,8] A recent study conducted after the first vaccines were approved has found that basic information about the vaccine and priming social approval benefits can increase vaccination uptake.[9] Recent evidence also suggests that messages about vaccination efficacy can increase acceptance and that respondents are most responsive to messages by medical experts.[10] However, there is no evidence so far how policy instruments that go beyond information campaigns and framing can reduce vaccination hesitancy.

We address this gap and test the effect of three strategies that governments can apply to raise the willingness to get vaccinated against Covid-19: granting freedoms, financial remuneration, and vaccination at local doctors. We identified these strategies based on previous research and the current political debate revolving around the roll-out of the Covid-19 vaccines. Our strategies focus on altering the costs and benefits of vaccination rather than on argumentation, framing, or moral reasoning (as examined in[7–10]).

The first strategy, *granting freedoms*, refers to policies that only reinstall certain liberties to people who are vaccinated while penalizing those without a vaccination. To increase vaccination uptake, Israel has for instance introduced the so-called "green passport" which grants access to social, cultural or sports events to individuals who have been vaccinated while penalizing those without a vaccination.[11] Other countries such as Germany, the United Kingdom and Chile are also debating immunity passports while the European Union is already preparing the launch of a European-wide vaccination passport. The idea of using negative incentives to encourage vaccination uptake is not new as for instance Australia's "no jab no pay" child bene-

fit scheme or vaccination requirements for daycare and school entry in Germany and many US states show.

The second strategy, *financial remuneration* refers to providing citizens monetary incentives for vaccination uptake. A large body of research in behavioural and health economics has shown that monetary incentives can be an effective instrument to steer human behaviour.[12–14] Most recently, research has shown that even small financial incentives can strongly increase the usage of a COVID-19 contact tracing app.[14] Various policy-makers and academics have accordingly proposed the payment of financial rewards for Covid-19 vaccination.[15,16]

The third strategy, *vaccination at local doctors*, rests on two ideas, namely the reduction of transaction costs and increasing trust.[17] A large body of research has demonstrated that transaction costs are a major reason why citizens do not uptake services or vote in elections[18,19] while research on vaccination hesitancy has shown that trust is a major predictor for vaccination uptake.[20] Allowing local doctors to vaccinate citizens instead of only administering the vaccine roll-out through vaccination centres can increase trust and reduce transaction costs (e.g. bureaucratic registration systems, inconvenient and distant locations or wait times).

Results

To evaluate the effectiveness of these strategies, we designed an experimental study embedded in a nationally representative online survey fielded in Germany (N=20,500). Our population of interest consists of all German citizens aged 18 to 75 years. The data was collected from 5 March to 25 March 2021 two months into the roll-out of the COVID-19 vaccination programme in Germany. In what follows, we will first provide descriptive evidence about vaccine hesitancy in Germany before we move on to the experimental study testing to what extent granting freedoms to vaccinated citizens, vaccination at local doctors and providing financial incentives can spur vaccination uptake.

Vaccine hesitancy

Among our sample we found that only 67% of respondents would accept a vaccine if it were available to them (see Figure 6 in the SM). This is close to the low bound for herd immunity.[2] Another 17% remain undecided and 16% would refuse to get vaccinated. Germany takes a middle position in vaccine hesitancy across countries—[3] find an average acceptance rate around 72% across nineteen countries, though with wide variation. As in other countries examined in,[3] institutional trust is an important correlate of hesitancy in Germany (see Figure 1). Moreover the arguments given for vaccine hesitancy are not specific to the German context (see figure 7 in the SM): When respondents in our sample give an account for their hesitancy, about two thirds describe concerns over the side effects, or adverse long term effects of the vaccine, with fewer (19%) discounting the seriousness of Corona. These features give some confidence that findings from Germany have implications that extend beyond the case.

We next provide evidence on how vaccine hesitancy is structured in Germany. As seen in Figure 1, education is a strong predictor for attitudes towards vaccination. Highly educated citizen are more likely to be acceptant whereas lower educated citizens are more likely to be hesitant or undecided. In addition, younger respondents and women are more likely to be undecided, but these relations are not substantively large. Similarly, employment status and professional position do little to explain hesitancy in Germany. A constellation of measures of general trust, trust in institutions, and support for the populist right AfD political party powerfully explain hesitancy. A majority of the hesitant respondents either support the AfD (20%) or support no party (37%). Among those accepting, there is just 3% support for the AfD and 21% support no party.

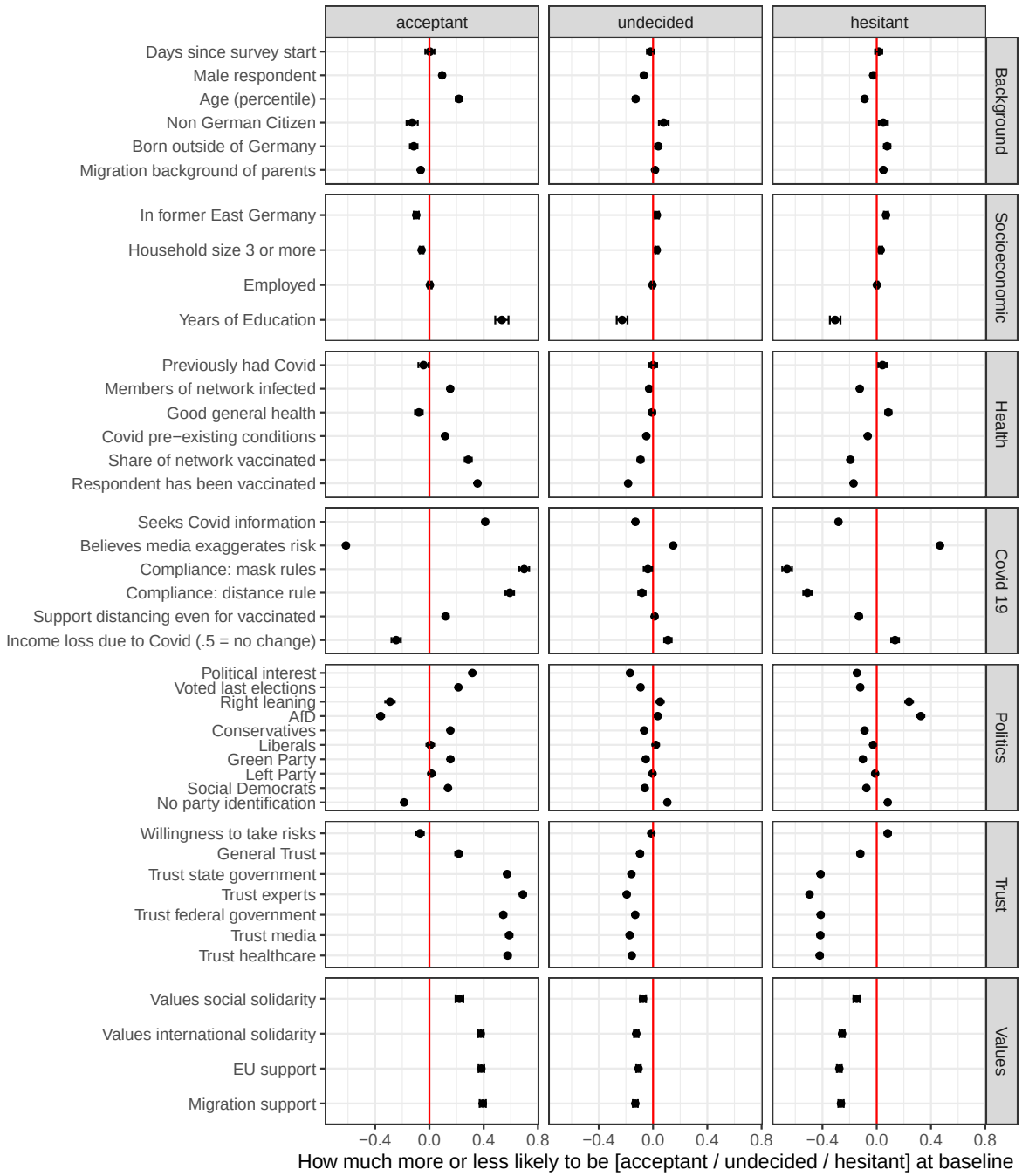

Figure 1: **Correlates of hesitancy** Coefficient from linear models separately regressing vaccine attitudes (columns) on different covariates with confidence intervals calculated using robust standard errors. Variables range from 0 - 1.

Table 1: Factors of mass vaccination scenario, by dimension.

Factor Z	Control (0)	Treatment (1)
Freedoms	There are **no special regulations** for vaccinated people even when the Corona incidence is high. For example, they cannot travel again, visit cinemas, restaurants or concerts and are still subject to contact restrictions.	**Special regulations** apply to vaccinated people. For example, even when the Corona incidence is high, they can travel again, visit cinemas, restaurants or concerts and are not subject to any contact restrictions.
Local Doctors	Eligible citizens can get vaccinated against Corona at the nearest vaccination center **but not at their local doctor**.	Eligible citizens get vaccinated against Corona at the nearest vaccination center **or at their local doctor**.
Financial Incentives	Citizens who are vaccinated **will not receive any allowance** after receiving the vaccination.	Citizens who get vaccinated **receive an expense allowance of 25 Euros** after receiving the vaccination. Citizens who get vaccinated **receive an expense allowance of 50 Euros** after receiving the vaccination.

Experimental study

In order to evaluate the effectiveness of the three strategies discussed above, namely providing freedoms, vaccination by local doctors and financial incentives, we designed a factorial survey experiment that was embedded in our representative survey. Factorial survey experiments ask subjects to evaluate hypothetical situations, objects or persons. By systematically varying attributes of the descriptions it is possible to identify the causal effect on respondents' stated attitudes, decisions, or choice.

In our factorial experiment illustrated in Table 1, participants were randomly exposed to

vignettes about a hypothetical policy context that varied along three dimensions: freedoms for vaccinated people (yes, no), financial incentives for vaccination (no, 25 Euros, 50 Euros) and vaccination at local doctors instead of vaccination centers (yes, no). Subsequently, respondents were asked about their willingness to get vaccinated under these different policy scenarios. Each respondent received two vignettes successively. However, respondents did not see the same profile twice. This design lets us estimate the effect of these three strategies on hesitancy as well as interactions between them. Furthermore, we are able to use machine learning approaches to shed light on how effective these strategies are for different subgroups. Details about the sample, the experimental design, and the statistical analyses can be found in the methods section.

Main Effects

We first report the main treatment effects of the mass vaccination scenario attributes on the probability that respondents take the vaccine pooling across all respondents and across the two scenarios presented to each respondent. Figure 2 plots the average effects of the three policy strategies (see also Table 4 in the SM) on reported uptake. Each treatment estimate in the figure should be interpreted relative to a control vignette that differs on the factor in question. The outcome is measured on a 0-1 scale and can be interpreted as a self-report of a respondent's probability of accepting Covid-19 vaccination.

The results demonstrate that German citizens are responsive to hypothetical changes in the vaccination regime. Three out of four treatments have sizable and statistically significant effects on the reported willingness to get vaccinated, with estimated effects ranging between 1 and 3 percentage points. We observe the lowest treatment effect for the low financial incentive (25 Euro) with 1 PP, 2.2 PP with high financial incentives (50 Euro), a 2.5 PP increase for the additional freedoms, and a 3 PP increase for vaccinations at the local doctor. All point estimates are significant at $p < 0.001$. Comparing effect sizes, we find that doubling the financial incentive

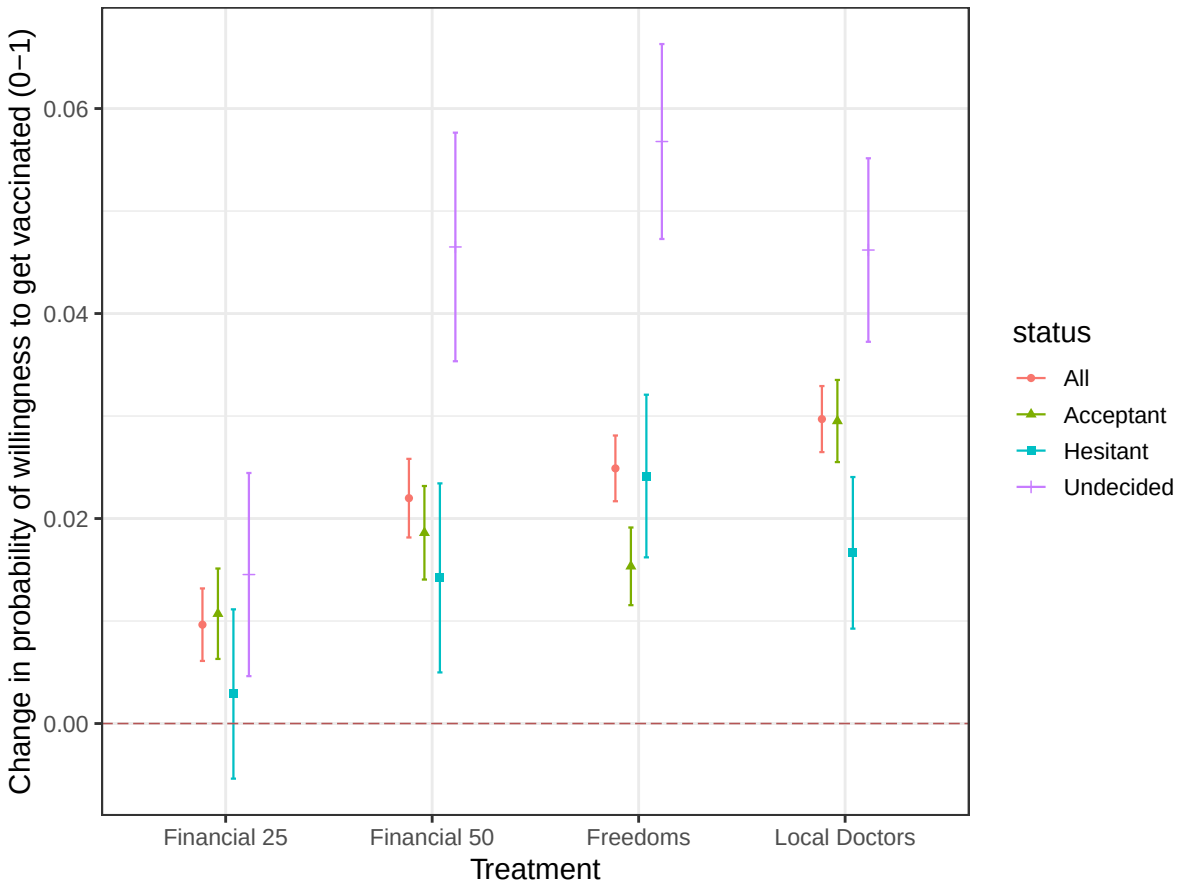

Figure 2: **Effects of mass vaccination scenario attributes on the probability that respondents take the vaccine in the scenario.** Dots with vertical lines indicate point estimates with robust 95% confidence intervals from least squares regression, accounting for individual level fixed effects. Table 4 in the SM displays the underlying regression results.

corresponds to a more than doubling of an effect on vaccination uptake. Interactions between these treatments are modest and generally not distinguishable from zero.

Subsetting by prior hesitancy, we see that the largest effects are for undecided respondents. Respondents who are hesitant are overall less likely to respond to any treatment conditions. For low financial incentives, we do not observe any significant effect for hesitant respondents and only low effects for the other groups. However, for those who remain undecided, the high financial treatment increases the share of respondents who say that they will get vaccinated by 5 PP ($p < 0.001$). Similarly, the possibility to get vaccinated at the local doctor increases the share by 5 PP ($p < 0.001$). We observe the strongest effect (6 PP) among the undecided for the personal freedoms treatment. The treatment effect is statistically different from the high financial and the local doctor treatment at $p < 0.05$.

	Acceptant	Hesitant	Vaccinated	Undecided
Constant (No incentives)	0.87^{***}	0.15^{***}	0.86^{***}	0.40^{***}
	(0.00)	(0.01)	(0.02)	(0.01)
Maximal incentives	0.07^{***}	0.06^{***}	0.06^{**}	0.13^{***}
	(0.01)	(0.02)	(0.02)	(0.01)
R^2	0.03	0.01	0.02	0.08
Adj. R^2	0.03	0.01	0.02	0.08
Num. obs.	4080	1081	464	1191
RMSE	0.19	0.29	0.22	0.23
N Clusters	3926	1032	443	1148

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 2: Effects of receiving all treatments compared to all control conditions

Using an omnibus test we compare the combined effects of all treatments (freedoms incentives, reduced costs, 50 Euro financial incentives) against a combined control group (no freedoms for vaccinated citizens, no vaccinations at local doctors, no financial incentives). Among the undecided we see a 13 PP increase in acceptance from a baseline of 40 percent ($p < 0.001$)

(see Table 2). Given that vaccination acceptance is just a few percentage points below the estimated threshold for herd immunity in many countries,[3] these are sizable effects that could help to achieve community immunity.

Heterogenous Effects

We supplement this analysis with a pre-registered machine learning approach that provides insights regarding which strategies are most effective for which population subgroups. We use a causal forests approach[21] which is a specific application of the generalized random forests algorithm.[22] We estimate Conditional Average Treatment Effects (CATEs) across all covariates in our data set (for details on covariates, see SM A). The approach randomly partitions the data and identifies which regression trees predict the largest variation in the magnitude of effects (for details, see the Methods section). To summarize the results from the causal forests, we calculate a measure of variable 'importance' used to estimate the heterogeneous treatment effects by taking a simple weighted sum of how often a variable was used in a tree split. The results (see Figure 8 in the SM) suggest that the age of the respondent, the date of the survey, the level of support for social distancing measures, general solidarity, and vaccination undecidedness are the most important predictors of heterogeneous treatment effects.

To see for which population subgroups the strategies have the strongest effect, Figure 3 reports coefficients derived from regressing scores based on the causal forest on selected covariates. The most important substantive finding is that the effectiveness of the strategies varies by age groups. Figure 4 depicts the treatment effects depending on age for undecided respondents. Older cohorts are more responsive to the opportunity to get vaccinated at local doctors, while younger cohorts are most receptive to granting freedoms to vaccinated citizens. In addition, we find that respondents who stated that they were *undecided* to get vaccinated showed higher treatment effects for high financial incentives and personal freedoms. Finally, the results

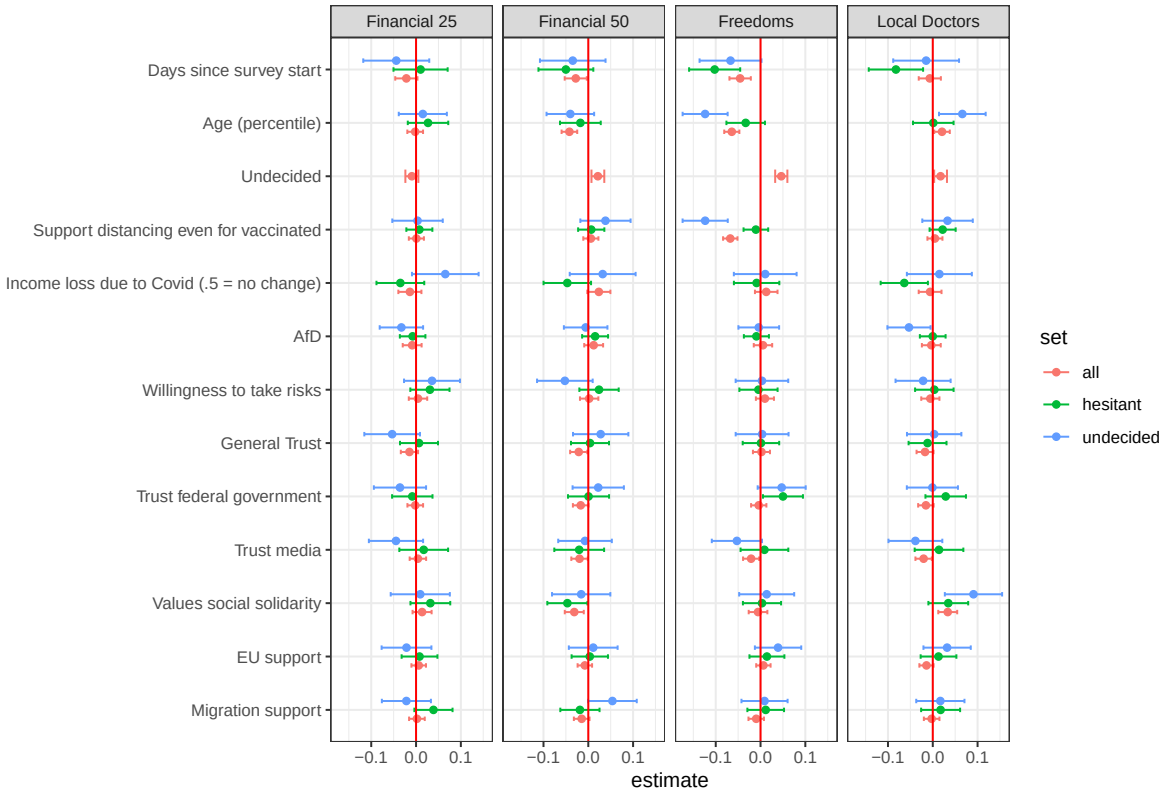

Figure 3: **Features that account for heterogeneity in treatment effects.** Dots indicate the coefficient for the best linear projections of covariates on effect heterogeneity, with positive (resp. negative) numbers indicating that average effects are more positive at higher (resp. lower) values of the covariate. 95% confidence intervals indicated with horizontal lines.

show that the effectiveness of these strategies vary over the time period of our study, possibly as a result of public discussions about the side effects of AstraZeneca vaccinations during that time period.

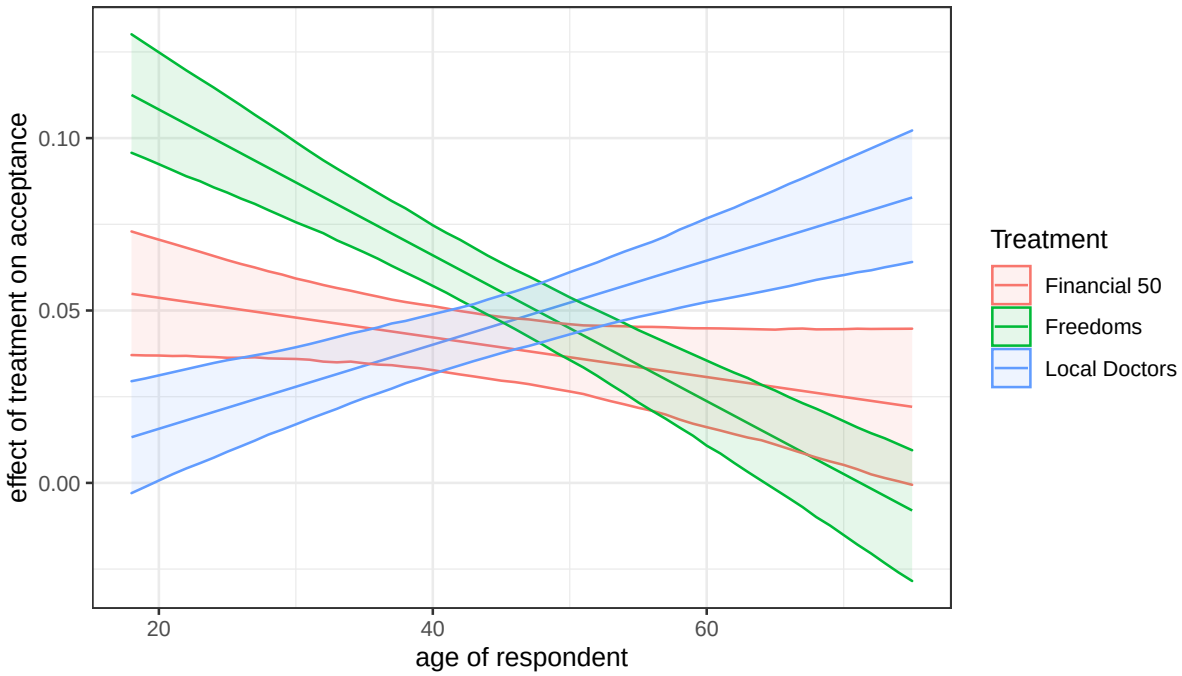

Figure 4: **Treatment effects depend on the age of respondents.** Heterogeneous treatment effects for each factor for undecided citizens.

Finally we point to a small set of moderators that relate to the social divisions in German society we pointed to above. We note first that we do not see marked heterogeneity by partisanship (comparing AfD supporters to others) or broad position on a Left/Right ideology scale. Nor do we see that reactions to treatments depend on the measured trustfulness of respondents. We do see however that hesitant respondents that report more solidarity, are generally more responsive to the opportunity to get vaccinated at local doctors (and less responsive to financial incentives). Overall these treatments are most effective for undecided respondents, but do little to alter the pattern of differences between hesitant and acceptant respondents.

Discussion

Vaccination is the key to overcoming the COVID-19 pandemic. However, in order to stop the spread of the virus, it is estimated that about 60-70% of the population needs to be vaccinated to stop the pandemic.[1,2] Survey evidence suggests that this threshold may not be met in many countries around the world.[3,4] Recent developments in the United Kingdom, Israel and the United States have shown that it is comparatively easy to vaccinate the first half of the population of citizens keen to get the vaccine. However, getting the undecided and hesitant citizens vaccinated which is required to pass the threshold for herd immunity is the real challenge that still lies ahead. Policy-makers around the world therefore search for effective strategies that can be adopted to increase vaccination uptake among undecided and skeptical citizens.

Our study contributes to this important and timely debate. We examined the effectiveness of three different policy instruments, namely providing freedoms, financial remuneration and vaccination at local doctors. We conducted a large-scale factorial experiment embedded in a representative public opinion survey to identify the causal effect of these strategies on the willingness to get vaccinated among 20,500 German citizens. Our results show that all three strategies can increase vaccination uptake among undecided citizens by about 5 percentage points.

What implications do have our results for policy-makers around the world? First, our results suggest that governments can increase vaccination uptake among undecided citizens by allowing local doctors to vaccinate citizens instead of only administering the vaccine roll-out through vaccination centres. Reducing transaction costs and relying on the trustful relationships between citizens and their local doctors is an effective instrument to reduce vaccination hesitancy. In addition, governments can increase the willingness to get vaccinated against COVID-19 by granting vaccinated citizens liberties that are not available to non-vaccinated citizens. Thus, by

only allowing vaccinated citizens to for instance participate in social events, to visit restaurants, concerts or bars or to travel again after months of social distancing, governments can effectively incentivize citizens to get vaccinated. Hence, by following the Isreali example where the government has issued the so-called "Green passport" for vaccinated people, governments can effectively reduce vaccination hesitancy. Finally, financial rewards can also increase uptake, but payments have to be sizable. All three strategies can be combined and largely appear not to substitute for each other.

The three policy strategies, providing freedoms, financial remuneration and vaccination at local doctors, vary in their effectiveness for different segments of the population however. While all three strategies have positive average effects, our findings suggest that the scope for altering behavior among truly hesitant respondents is limited. Governments can do better by focusing on undecided citizens for whom combined effects could be as high as 13 PP. In addition, the choice of strategy depends on the age profile of undecided citizens: governments seeking to increase vaccination uptake among undecided younger cohorts may see greater returns from enhancing freedoms while governments focused on undecided older citizens will see greater returns from ensuring provision at local doctors.

Methods

Consent and ethics

The study was pre-registered before data collection on 3rd of April 2021 at `https://doi.org/10.17605/OSF.IO/H8RKB`. Ethical approval was obtained by the institutional review board at Humboldt University.

Data

Sample & Recruitment

Our population of interest consists of all German citizens aged 18 to 75 years. We rely on a representative sample of 20,500 citizens across Germany. The data was collected from 5 March to 25 March 2021. We fielded the study relying on the online access panel of the survey company Respondi. Respondi relies on online channels and offline channels to recruit new panelists for its online panel. After completing a profiling questionnaire covering basic sociodemographic information, panelists are then invited to participate in surveys. Respondi compensates its panelists for completing a survey. In our study, the incentive was EUR 0.75 for a median length of interview (LOI) of approximately 15 minutes.

Pre-Treatment Covariates

Before the experiment, we collect several covariates that are predicted to moderate the effect of the treatments on our outcome vaccine uptake. We include trust in government and local health system,[23] trust in health personnel,[24] economic hardship and eduction,[25] minority group status and maternal age,[26] risk perception[27] and health status.[28] Additionally, we collect data on political attitudes, attitudes towards migrants, and attitudes towards COVID-19 as well as indicators that identify groups who are eligible for the vaccine. Please see the questionnaire in the Supplementary Materials for details.

Experimental Design & Analysis

In the factorial survey experiment, participants were randomly exposed to different hypothetical policy instruments (special rights for vaccinated people, financial incentives for vaccination and vaccination at local medical practices). Subsequently, we questioned respondents about their willingness to get vaccinated under these different policy scenarios. The experiment relies on

a single profile forced choice conjoint experiment using 2x2x3 factorial design, with factors assigned with independent probabilities. Each respondent was asked to indicate the willingness to get vaccinated under two hypothetical policy contexts, and for each profile we randomly assigned the values of all attributes. The treatment consists of a vignette consisting of the following policy factors Z with randomly assigned levels L. Our main outcome variable is the vaccination probability under the different treatment conditions which takes on values between 0 ("I will definitely not be vaccinated against Corona") and 10 ("I am sure to get vaccinated against Corona"). We rescale the outcome to take on value between 0 and 1.

Main Estimation.

We seek to estimate the average effect of each treatment, averaged over other treatment conditions. We estimate treatment effects using an OLS regression with individual level fixed effects and heteroskedasticity-robust standard errors:

$$\begin{aligned} Y_{it} &= \beta_0 + \beta_1 Z_{it}^1 + \beta_2 Z_{it}^2 + \beta_3 Z_{it}^{3,\text{ low}} + \beta_4 Z_{it}^{3,\text{ high}} + \\ &\quad \beta_5 Z_{it}^1 Z_{it}^2 + \beta_6 Z_{it}^1 Z_{it}^{3,\text{ low}} + \beta_7 Z_{it}^1 Z_{it}^{3,\text{ high}} + \beta_8 Z_{it}^2 Z_{it}^{3,\text{ low}} + \beta_9 Z_{it}^2 Z_{it}^{3,\text{ high}} \\ &\quad + \beta_{10} Z_{it}^1 Z_{it}^2 Z_{it}^{3,\text{ low}} + \beta_{11} Z_{it}^1 Z_{it}^2 Z_{it}^{3,\text{ low}} + u_i + \epsilon_{it} \end{aligned}$$

where Y is a continuous variable measuring the reported likelihood of vaccination of participant i for two policies ($t \in \{1, 2\}$) each described by three conditions Z^1 (Freedoms), Z^2 (Local Doctor), $Z^{3,low}$ (Financial remuneration 25 Euros), $Z^{3,high}$ (Financial remuneration 50 Euros)). Conditions are centered with 0 mean. With this normalization $\beta_1 - \beta_4$ capture the average fixed effects averaged over conditions of other variables.[29]

Heterogeneous Treatment Effects

In the second step of the analysis we use the Generalized random forests (grf) package in R (CRAN, 0.10.2) to identify variation in treatment effects for our different binary treatments Z. The algorithm selects variables X and determines whether to "split" a variable in order to maximize a heterogeneity criterion. Repeated application produces a "tree" with leafs at the end of the tree containing observations that split in the same way at all decision points.[30]

The results (Supplementary Fig. 8) provide a rough diagnostic of variable importance "simple weighted sum of how many times feature i was split on at each depth in the forest." It is possible that a variable is predictive of heterogeneity, but is accorded low importance if it is highly correlated with other predictive variables (see Supplementary Fig. 6 for the complete correlation matrix).

Predicted effects are generated by a weighted average of outcomes for each observation's neighbors—where neighbors are observations that more commonly end up in the same leaf as an observation. We also pre-registered to examine heterogeneous treatment effects across self-reported partisanship, political ideology, risk aversion, and trust. However, we find no strong evidence of heterogeneity across those variables.

We plot coefficient of the best linear projection for all covariates that appear among the top three predictors for at least one treatment, taken one at a time. These coefficients correspond to the coefficent β in the estimating equation $ATE = \alpha + \beta X$ for covariate X.

Data availability

Replication data for the complete analysis is provided at `https://wzb-ipi.github.io/covid_hesitancy_2021`. A copy of the questionnaire used in this study can be obtained at `https://doi.org/10.17605/OSF.IO/H8RKB`.

Code availability

Replication code for the complete analysis is provided at `https://wzb-ipi.github.io/covid_hesitancy_2021`.

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Supplementary Materials

What incentives can spur Covid-19 vaccination uptake?

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Contents

A Descriptive Statistics

A.1 Correlations between covariates

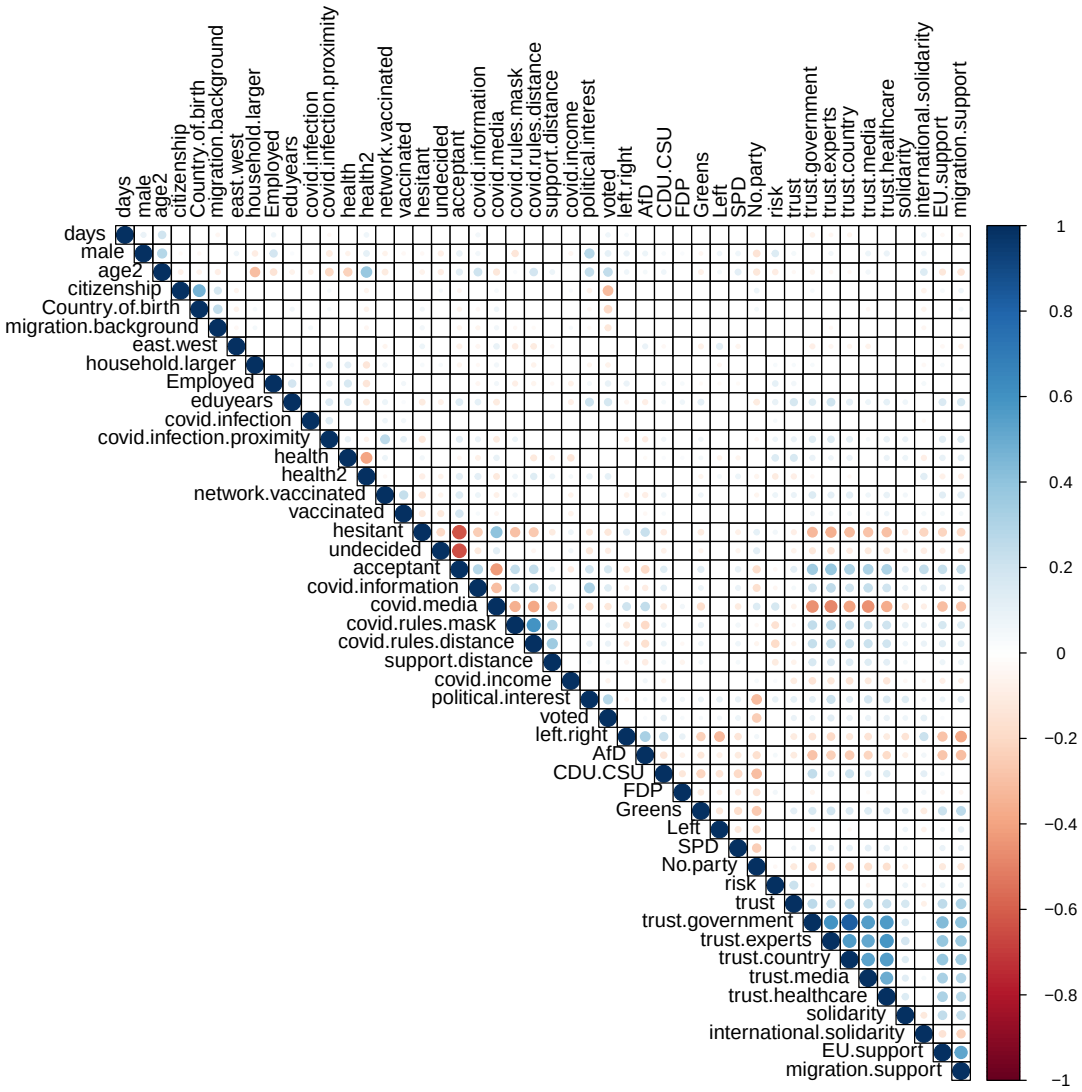

Figure 5: A square is colored only if (unadjusted) p-value for a pair of variables is less than 0.05.

Table 3: Summary statistics

Variable	Mean	Stdev	Minimum	Lower quartile	Median	Upper quartile	Maximum
Days since survey start	0.57	0.19	0.05	0.38	0.57	0.71	1.00
Male respondent	0.50	0.50	0.00	0.00	0.00	1.00	1.00
Age (percentile)	0.49	0.27	0.00	0.26	0.51	0.72	1.00
Non German Citizen	0.03	0.16	0.00	0.00	0.00	0.00	1.00
Born outside of Germany	0.06	0.24	0.00	0.00	0.00	0.00	1.00
Migration background of parents	0.23	0.42	0.00	0.00	0.00	0.00	1.00
In former East Germany	0.15	0.36	0.00	0.00	0.00	0.00	1.00
Household size 3 or more	0.33	0.47	0.00	0.00	0.00	1.00	1.00
Employed	0.44	0.50	0.00	0.00	0.00	1.00	1.00
Years of Education	0.36	0.13	0.00	0.28	0.28	0.44	0.56
Previously had Covid	0.03	0.17	0.00	0.00	0.00	0.00	1.00
Members of network infected	0.40	0.36	0.00	0.00	0.50	0.50	1.00
Good general health	0.65	0.23	0.00	0.50	0.67	0.83	1.00
Covid pre-existing conditions	0.41	0.49	0.00	0.00	0.00	1.00	1.00
Share of network vaccinated	0.25	0.24	0.00	0.00	0.25	0.50	1.00
Respondent has been vaccinated	0.06	0.25	0.00	0.00	0.00	0.00	1.00
Hesitant	0.16	0.37	0.00	0.00	0.00	0.00	1.00
Undecided	0.17	0.38	0.00	0.00	0.00	0.00	1.00
Acceptant	0.67	0.47	0.00	0.00	1.00	1.00	1.00
Seeks Covid information	0.73	0.32	0.00	0.50	0.75	1.00	1.00
Believes media exaggerates risk	0.42	0.32	0.00	0.25	0.50	0.75	1.00
Compliance: mask rules	0.90	0.16	0.00	0.80	1.00	1.00	1.00
Compliance: distance rule	0.82	0.19	0.00	0.80	0.80	1.00	1.00
Support distancing even for vaccinated	0.71	0.30	0.00	0.50	0.75	1.00	1.00
Income loss due to Covid (.5 = no change)	0.59	0.19	0.00	0.50	0.50	0.75	1.00
Political interest	0.65	0.29	0.00	0.33	0.67	1.00	1.00
Voted last elections	0.83	0.38	0.00	1.00	1.00	1.00	1.00
Right leaning	0.44	0.18	0.00	0.30	0.50	0.50	1.00
AfD	0.07	0.26	0.00	0.00	0.00	0.00	1.00
Conservatives	0.20	0.40	0.00	0.00	0.00	0.00	1.00
Liberals	0.05	0.23	0.00	0.00	0.00	0.00	1.00
Green Party	0.16	0.37	0.00	0.00	0.00	0.00	1.00
Left Party	0.08	0.26	0.00	0.00	0.00	0.00	1.00
Social Democrats	0.14	0.34	0.00	0.00	0.00	0.00	1.00
No party identification	0.27	0.44	0.00	0.00	0.00	1.00	1.00
Willingness to take risks	0.41	0.24	0.00	0.20	0.40	0.60	1.00
General Trust	0.41	0.25	0.00	0.20	0.40	0.60	1.00
Trust state government	0.44	0.29	0.00	0.25	0.50	0.75	1.00
Trust experts	0.64	0.26	0.00	0.50	0.75	0.75	1.00
Trust federal government	0.45	0.27	0.00	0.25	0.50	0.75	1.00
Trust media	0.38	0.25	0.00	0.25	0.50	0.50	1.00
Trust healthcare	0.57	0.26	0.00	0.50	0.50	0.75	1.00
Values social solidarity	0.58	0.23	0.00	0.50	0.50	0.70	1.00
Values international solidarity	0.58	0.31	0.00	0.40	0.50	0.80	1.00
EU support	0.52	0.29	0.00	0.30	0.50	0.70	1.00
Migration support	0.48	0.27	0.00	0.30	0.50	0.70	1.00

A.2 Distribution of selected variables

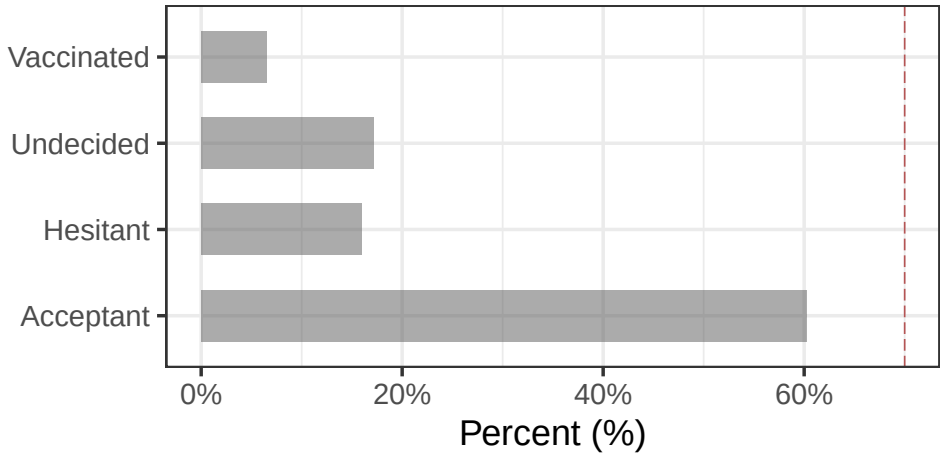

Figure 6: Distribution of the outcome variable. Question: Vaccination Probability: Please use this scale to indicate how likely it is that you would be vaccinated against corona under these conditions.

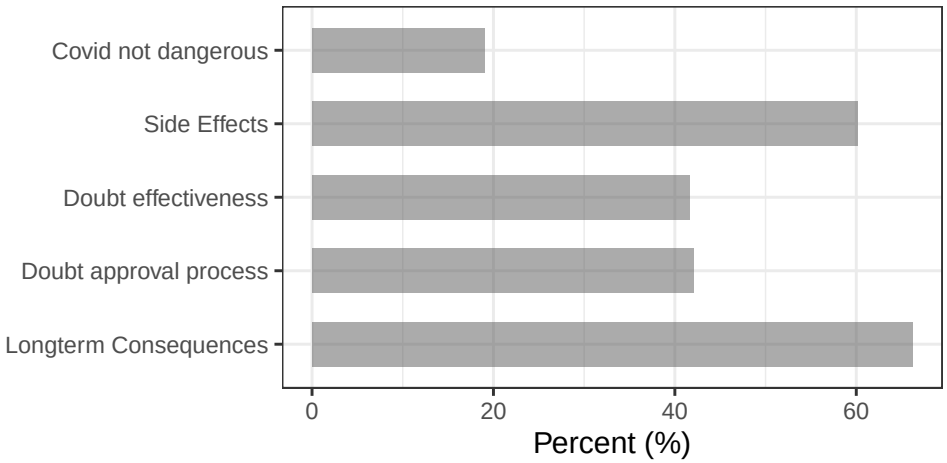

Figure 7: Reasons given for being hesitant or undecided.

B Main results in tabular form

	Acceptant	Hesitant	Vaccinated	Undecided	All
Constant (No incentives)	-0.005^{***}	-0.003	-0.003	-0.003	-0.004^{***}
	(0.001)	(0.003)	(0.004)	(0.003)	(0.001)
25 Euro incentive	0.011^{***}	0.003	0.004	0.015^{**}	0.010^{***}
	(0.002)	(0.004)	(0.006)	(0.005)	(0.002)
50 Euro incentive	0.019^{***}	0.014^{**}	0.010	0.046^{***}	0.022^{***}
	(0.002)	(0.005)	(0.009)	(0.006)	(0.002)
Freedoms	0.015^{***}	0.024^{***}	0.030^{***}	0.057^{***}	0.025^{***}
	(0.002)	(0.004)	(0.006)	(0.005)	(0.002)
Local doctors	0.030^{***}	0.017^{***}	0.015^{*}	0.046^{***}	0.030^{***}
	(0.002)	(0.004)	(0.007)	(0.005)	(0.002)
Freedoms * 25 Euros	0.007^{*}	0.005	-0.006	0.010	0.006^{*}
	(0.003)	(0.007)	(0.010)	(0.009)	(0.003)
Freedoms * 50 Euros	0.007^{*}	0.003	-0.006	0.007	0.006
	(0.004)	(0.007)	(0.014)	(0.009)	(0.003)
Freedoms * Local doctors	-0.003	0.003	0.008	0.020^{**}	0.002
	(0.003)	(0.006)	(0.010)	(0.007)	(0.003)
Local doctors * 25 Euros	0.002	-0.007	-0.019	-0.001	-0.001
	(0.003)	(0.006)	(0.010)	(0.008)	(0.003)
Local doctors * 50 Euros	-0.001	-0.007	-0.006	0.005	-0.002
	(0.003)	(0.007)	(0.013)	(0.008)	(0.003)
Freedoms * Local doctors * 25 Euros	0.001	0.018	-0.019	-0.030^{*}	-0.003
	(0.005)	(0.010)	(0.015)	(0.012)	(0.004)
Freedoms * Local doctors * 50 Euros	-0.003	0.010	-0.016	-0.034^{*}	-0.006
	(0.005)	(0.011)	(0.019)	(0.014)	(0.005)
R^2	0.030	0.025	0.032	0.104	0.037
Adj. R^2	0.030	0.021	0.024	0.101	0.037
Num. obs.	12357	3276	1344	3523	20500
RMSE	0.151	0.153	0.160	0.189	0.160

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 4: Main results, with interactions. Individual fixed effects modelled by regressing differences in responses across two vignetters on differences in treatments and interactions. All treatments are centered on zero for each group.

C Heterogenous effects

C.1 Predictors of heterogeneous effects

Figure 8: **Predictors of heterogeneous effects.**