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Abstract

The COVID-19 vaccines played a pivotal role in safeguarding populations. Yet, vaccine hesitancy remained a significant barrier to increasing coverage rates, as many high-income countries faced prolonged vaccine refusal campaigns. In Japan, vaccine doses were administered under a reservation system accessible via a website and by phone. Achieving a high vaccination coverage for a vaccine that was offered at no financial cost was still surprisingly difficult in Japan. In many countries, vaccine hesitancy during the pandemic has been closely related to people's trust in their governments given governments' controversial social distancing mandates. In Japan, lockdowns were voluntary, and vaccinations were also not mandated. As there were no significant political conflicts about the government's policies, vaccination acceptance was influenced by more basic tenets, and here we focus here on social capital, defined as cohesive resources that enable a society to function effectively. Social capital, in this context, refers to community trust, collaboration, and engagement that create social bonds between individuals and society. Using a unique, large, survey, administered repeatedly through the years of the pandemic, we mostly found support, for the hypothesis that social capital matters for the vaccination decision; and that it matters even once we control for institutional trust (especially trust in the medical system). However, this general association between trust in other community members, trust in the willingness of community members to engage in reciprocal assistance, and trust in the more general willingness of the community to support individuals, were all associated differently with the vaccination decision, and with the views about vaccinations. From a policy perspective, this suggests that the Japan case both exposes the relevance of trust in government, in other circumstances, but also shows that intra-community trust (i.e., social capital), is important even in contexts when governmental trust is not a significant issue.

JEL-Codes: I120.

Keywords: vaccine, Covid-19, social capital, trust.

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1. Introduction

During the global COVID-19 pandemic, vaccines have emerged as the primary, cost-effective public health tool to prevent serious health and life endangering consequences in societies across the world. The COVID-19 vaccines thus played a pivotal role in safeguarding populations from the virus and its affects. Their swift development and deployment in late 2020 clearly helped to contain the spread and severity of the COVID-19 pandemic. Retrospective statistical analysis found the vaccine prevented an estimated 1.6 million additional deaths in Europe alone (Meslé et al., 2024) or 2.3 million globally (Agrawal et al., 2023) but computer modelling of the disease spread typically identified much bigger numbers (up to 20 million deaths in the vaccine's first year; in Watson et al., 2022). Of course, vaccines are deployed not only to fight against global pandemics, and their role in fighting epidemics or more generally infectious diseases has long been central for public health.

Yet, despite a long experience with many safe vaccines, and research establishing the safety and efficacy of the COVID-19 vaccinations, vaccine hesitancy remained a significant barrier to increasing coverage rates to levels that can induce herd immunity (Dubé & MacDonald, 2022). Many high-income countries faced prolonged vaccine refusal campaigns for a variety of vaccines and infectious diseases, with acceptance and uptake rates widely differing across countries (Wang et al., 2022). For COVID-19, many countries, globally, have not achieved the recommended coverage rate for the initial vaccination protocol (Mathieu et al., 2023) – a coverage rate that significantly affects the aggregate spread of the disease and is thus important for population health.

As a reminder, in March 2020 the World Health Organization declared a pandemic in response to the spread of a highly infectious novel coronavirus that has first emerged in December 2019. Vaccination development began very quickly, and the first vaccine was already authorised for emergency use by the end of 2020. In Japan, the country which we focus on, the vaccine was approved in February 2021 for the Pfizer vaccine and in May 2021 for the Moderna, AstraZeneca, and Johnson & Johnson vaccines. Early doses started to be used on February 17th, 2021, for medical workers (approximately 4. 7 million people), then for people 65 years or older from April 12th, 2021 (approximately 36 million people), and for all people 18 years or older from June 1st, 2021.[1]

[1] https://www.kantei.go.jp/jp/headline/kansensho/vaccine_supply.html.

Vaccine doses were administered by municipality offices, healthcare centers, and some hospitals under a reservation system accessible via a website and by phone. In addition, the Japanese government allowed some universities and large companies to provide vaccines. As public concern and fear increased, vaccination centers were overwhelmed with demand and thus many people who had reserved had to wait a few weeks to a few months for their vaccination. This waiting period, however, happened long before the survey we rely on the gauge vaccine behavior.

Achieving a high vaccination coverage for vaccines that are offered at no financial cost was still surprisingly difficult in Japan, as was the case in many other countries (though not all of them). Thus, understanding what determined people's acceptance of the vaccine remains essential in addressing (any) vaccine hesitancy. In many countries, vaccine hesitancy during the pandemic has been closely related to people's trust in their governments. Governments the world over have played an outsized and novel role in responding to this pandemic, with stringent restrictions placed in many places on personal movement, work practices, and even socializing. This aggressive and unprecedented response led, in many places, to a 'trust' crisis between many people and their government.

In Japan, however, there were few strict regulations or penalties for individual behavior, as the lockdowns were voluntary. The Japanese government requested the public's cooperation rather than demanded or mandated it. That may be one reason why the general COVID response policy did not generate, in Japan, a violent backlash as it did in many other places. As a result, vaccinations were also neither mandatory nor heavily enforced; for example, through restrictions about what activities the unvaccinated can be involved in (Cameron-Blake et al., 2023). In spite of it, the vaccination rates were high within a comparably short period. Elderly people started the first dose in April 2021 and around 80% of them finished the second dose by the end of July 2021. For all other people above age 18, whose vaccination started in June 2021, around 77% of them finished the second dose as of the end of November 2021. Regarding anticipatory vaccine hesitancy, around 50% of the Japanese people were eager to take vaccination, around 20-30% were indecisive and 10-20% hesitated about it as of February 2021, before the first doses of the vaccine started (Kadoya et al. 2021; Nomura et al. 2021; Okubo et al. 2021; Okubo, et al. 2021; Okamoto et

al. 2022).[2]

We hypothesize that, in Japan, where there were no significant political conflicts about the voluntary lockdowns in general, and vaccination in particular, vaccination behavior was influenced by more basic tenets. In particular, we focus here on social capital, defined as cohesive resources that enable a society to function effectively. These social capital ties are accessed by individuals as a result of membership of a certain group and community.[3] In order to identify the association between social capital and the willingness to vaccinate, we also need to control for other aspects of each respondent that may affect their acceptance of the vaccine. In particular, we also control for the health condition of the individuals considering a vaccination, other non-cognitive factors associated with them, and their other socio-demographic traits.

Social capital, in this context, refers to community trust, collaboration, and engagement that create social bonds between individuals and society (e.g. Putnam et al., 1993; Coleman, 1988; Bourdieu, 1986). Social capital can facilitate and influence decision-making about vaccination through the exchange of information, by identifying problems and concerns, and by ameliorating the emergence of conflicting or false information in communities. Evidence that supports this conjecture of a link between social capital and health-related choices were identified for H1N1 vaccination decisions by parents for their children (Jung et al. 2013), for protective behaviors against influenza in Taiwan (Chuang et al. 2015), and, using aggregate community-level vaccination rate data, for the average vaccination uptake in the Lombardy region of Italy during the COVID-19 pandemic (Buonanno et al. 2023). In Japan, similar association was identified in both aggregate and micro-level data for measles vaccinations (Nagaoka et al. 2012; Nawa and Fujiwara, 2019) and pneumococcal vaccination in the large sample of the Japan Gerontological Evaluation Study (Iwai-Saito et al, 2021).

Several studies assessed the relationship between social capital and Covid-19 vaccination decisions using survey data in various countries. Several focused on either bonding social capital (i.e., relationships between family, friends or in a community), and bridging social capital (i.e., connections formed between different communities). In this literature, the decision to get vaccinated was found to be positively associated with social trust (Kreps and

[2] Specific groups were more hesitant. Takahashi et al. (2022) find that 51% of pregnant women and 32% of mothers of young children were vaccine hesitant.
[3] Aldrich (2012) differentiates between bonding, bridging, and linking social capital in the context of disasters. Here we focus on what Aldrich (2012) defines as bonding social capital.

Kriner, 2023; Oshio and Ping, 2023), social cohesion (Kim and Lim, 2024; Machida et al., 2022; Oshio and Ping, 2023), and perceived social support (Datta et al., 2023). Vaccination decisions also appear to be influenced by opinions about the vaccine and the 'peer pressure' (i.e., vaccination decisions of family and friends) (Bernados and Ocampo, 2022; Latkin et al., 2022).

Other studies focus on the effects of linking social capital (i.e., the vertical connections to the political center). These measured trust in institutions such as government, healthcare or media institutions. Here, the decision to get vaccinated was found to be positively associated with trust in the government (Bajos et al., 2022; Cvjetkovic et al., 2022; Oshio and Ping, 2023; Latkin et al., 2023; Lomeli et al., 2023; Rivera, 2023; Viskupič et al., 2022), trust in healthcare providers, medical experts, scientists, and vaccine approval systems (Bajos et al., 2022; Cvjetkovic et al., 2022; Lomeli et al., 2023; Viskupič et al., 2022; Cao et al., 2024), and trust in official information sources and the traditional media (Cao et al., 2024; Juarez et al., 2022a, 2022b; Latkin et al., 2023).

Regarding COVID-19 in Japan, public debates about vaccination mainly focused on safety concerns, scheduling and prioritization issues, and vaccine supply (imports and distributional logistics), and not on contentious mandates or lockdowns. This stands in stark contrast to other countries where the vaccination campaign was often seen as a proxy referendum about the reigning government's policy choices during the pandemic's initial phase. In many cases, it took on importance as an ideological litmus test of fealty to the current leadership in office.[4]

It is important to note that the unique Japanese background for these dynamics is deeply rooted in the Japanese Constitution.[5] After Japan's defeat in World War II, the country was occupied by the U.S. military, which sought to eliminate the threat of any future Japanese imperial aspiration. The constitution enacted in 1947 explicitly states that the government, including the police, cannot force people to act in ways that infringe on the individuals' human and property rights.[6] Thus, for constitutional reasons, Japan was unable and probably unwilling to impose mandatory lockdowns that included penalties or sanctions, as was done

[4] This even led to situations in which the opposition to vaccines was mostly from the Right (e.g., in the US or Canada) or from the Left (e.g., in Israel) as the government was from the 'other side of the aisle.'

[5] https://www.japantimes.co.jp/opinion/2020/04/14/commentary/japan-commentary/coronavirus-japans-constitution/. https://www.reuters.com/article/world/lockdown-japan-style-pressure-to-conform-not-penalties-for-non-compliance-idUSKBN21P0EU/

[6] In response to the pandemic, there were some who called to amend the Constitution to include emergency provisions that would allow the government to enforce control measures in case of national emergencies. There are others who still strongly oppose such proposals.

in almost all other high-income countries, and in many middle- and low-income ones, as well.

The Japan case thus provides us an opportunity not to focus on trust in government and other institutions of power as determinants of vaccine hesitancy.[7] Rather, we can focus here on people's perceived social connections (social capital), and specifically their views about their commitments to their community and the community's commitment to them. This paper thus seeks to explore how effective was Japan's vaccination campaign, which relied on the power of these social connections, while it avoided strict lockdowns. As such, this is the main advantage of this analysis of the Japanese case, compared to jurisdictions where these two aspects - trust in government and other institutions, and the strength of social connections) were muddled.

In the following pages, we first describe the unique dataset we use, a repeat large-scale panel survey conducted in Japan over multiple years (section 2) and the methodology we use to empirically examine the association between vaccination decisions and perceived social capital (section 3). We then describe and discuss our results (section 4) and conclude with some thoughts about future directions and the policy implications of our findings.

2. Data and variables to use

2.1. Panel Survey, Data, and Variables to use

The data used in this study comes from the Okubo-NIRA survey (Okubo and NIRA, 2020a,b,c, 2021a,b, 2022), "Questionnaire Survey on the Effects of the Spread of COVID-19 on Telework-based Work Styles, Lifestyle, and Awareness." This is a panel survey conducted in Japan over eleven waves of approximately 10,000 workers in a randomly stratified sample as of November 2024.[8] The survey asked about worker's characteristics, their lives, and their working environments. The first wave was conducted in March 2020, just before the spread of the epidemic to Japan and the declaration of the first state of emergency in the country in April 2020. As of writing, the latest wave was conducted in July 2024. See Figure 1 for details about the timing of survey waves and the aggregate number of COVID-19 infections in Japan. The sample sizes in the first, second, third, fourth, fifth, sixth, and seventh waves were 10,516,

[7] As was done, for example, in Allington et al. (2023) in the UK, Blamey and Noy (2024) in New Zealand, Colegrove et al. (2022) in the US, Falcone et al. (2022) in Italy, Jang (2022) in Korea, Mankell and Abdelzadeh (2023) in Sweden, and Pagliaro et al. (2021) in cross-country analysis.

[8] See https://nira.or.jp/paper/data/2022/26.html for the data link

12,138, 10,523, 9,796, 10,644, 10,113, and 10,595 respectively. Many respondents repeatedly responded to the survey over multiple waves.[9]

For the purposes of this study, we primarily use data from wave 6 (February 2022), which focused on vaccination. This wave collected information on the number of vaccine doses received, the vaccine's side effects, opinions and perceptions about the vaccination programme, the respondents' COVID-19 infection status, their pre-existing illnesses and mental health during the pandemic, and their family's health. Wave 6 took place around the time when the third vaccine dose was introduced in Japan. Although wave 5 (September 2021) also collected some vaccination-related data, it only asked about the number of doses and the willingness to be vaccinated, and these questions were also asked in wave 6. Therefore, wave 6 serves as the main data source for our study, but wave 5 is used to investigate the change of vaccination behaviors as a complementary analysis. Out of total sample of wave 6 (10,113), 8,058 respondents also participated in wave 5.

Additionally, we incorporate data from wave 4 (April 2021), which examined the willingness to commute. The need or desire to commute in public transportation may also be positively related to individuals' willingness to receive vaccinations. Out of total sample of wave 6 (10,113), 6,945 respondents participated also in wave 4.

[9] The survey was conducted on a website constructed by Nikkei Research Co. The survey takes a stratified random sampling strategy. Japan is stratified into five regions by regional classification and six age groups for each gender (12 age groups per region). The number of samples for 60 region–age groups was determined by population ratio. The Labor Force Survey (Ministry of Internal Affairs and Telecommunication) was employed as the sampling unit. The survey intended to construct the panel structure and thus keep the same respondents over waves as much as possible. Some respondents repeatedly participated in the survey, and some did not. New respondents were added to fill in the allocated number of samples in each unit. Therefore, our data has no response rate.

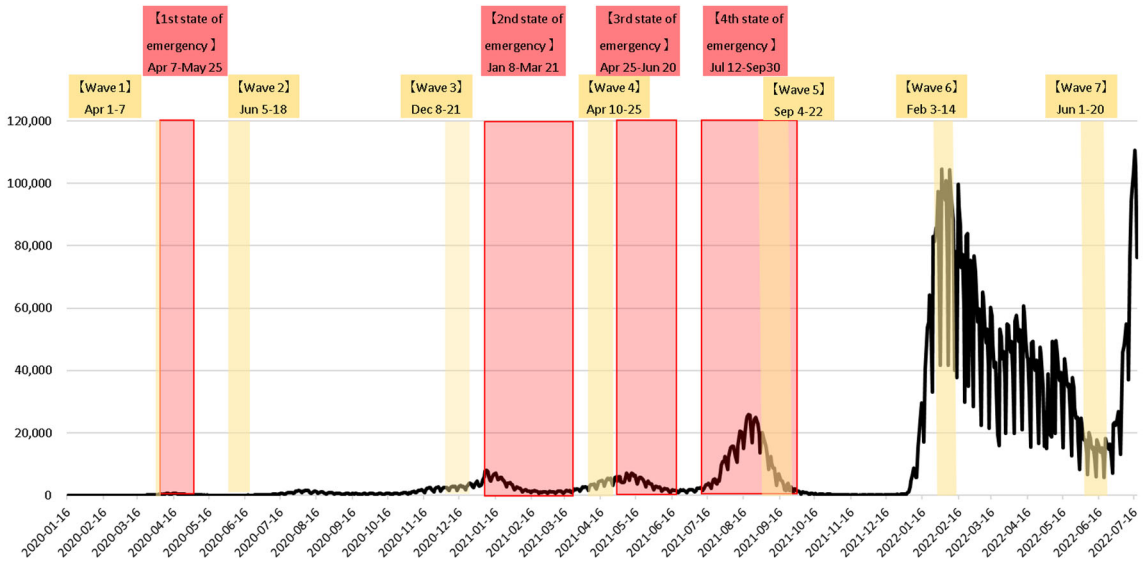

Figure 1: COVID-19 infections, emergency state, and survey waves (until wave 7, July 2022)

In our setup, the declared vaccination choice is the dependent variable – our focus is explaining this choice. The dependent variable is regressed on two sets of explanatory variables: (1) basic socio-economic traits and (2) non-cognitive and health conditions. The basic socio-economic traits we can include are age, gender, income, occupation, employing firm size, employment status, educational background, ICT skills, the proportion of new COVID-19 cases in the respondent's residential municipality, teleworking, and other changes in life circumstances (time allocation, income, and life satisfaction).[10] The non-cognitive and health factors consist of variables related to social capital (our focus), the respondent's health condition (including COVID-19 infection and pre-existing illnesses), fear of infection, previous side effects from vaccination (if applicable), family infection status, and changes in trust toward central/local government and the medical system from the pre-pandemic to the pandemic period.

The survey first asked about the respondents' characteristics; this included gender, age (scaled by decade), annual income in 2021 (scaled by 500 thousand yen), education (final

[10] The number of daily new infections per population (i.e. infection rate) is as of the first day of the month when the survey was conducted. We collected the numbers of daily new infections at each municipality from each municipality's website. In rural areas, the number is not available at the municipality level but available at the health-center level jointly handled by nearby municipalities. The number in the rural area is derived from the health-center level number divided by population of the municipalities covered.

degree ranged from junior high school=1, high school=2, college=3, university=4, master=5, to Ph.D.=6), and ICT skills required for work (0= no need, 1=preliminary, 2=middle, 3=advanced), occupation (38 categories), employment status (6 categories, e.g. regular, non-regular), and firm size (6 categories) (See Appendix Tables 1 and 2 for more details).

2.2. Vaccination behavior

The survey asked respondents about the number of vaccine doses they had received and their willingness to be vaccinated, offering six options. This forms the dependent variable in our estimations ("Vaccination"). After wave 5 (September 2021), during the period of wave 6 (February 2022), the third dose of the vaccine began to be administered. Respondents were asked to choose one of the following six options regarding their willingness to be vaccinated and their vaccination behavior: You have received the third dose (=5); you want to receive the third dose but have not yet (=4); you have received the second dose but do not intend to receive the third (=3); you have received the first dose but do not intend to receive the second (=2); you want to receive the first dose but have not yet (=1); you do not intend to receive any vaccination (=0). A higher value generally indicates a greater willingness to be vaccinated. See Appendix Table 1

Table 1 describes the responses of all those who answered both wave 5 and wave 6 of the survey. We point out there is a small number of respondents (114 out of 7562) whose responses between the two surveys were inconsistent. Otherwise, we observe that the majority of people have already taken the second dose by wave 5, and of these, about 90% intended to take the third dose as well (or have already done so). About 10% of the respondents have indicated they do not intend to vaccinate at all.

2.3. Opinions about vaccination

The survey asked respondents about their opinion about the COVID-19 vaccination ("percep"). For each statement, respondents were asked to choose whether they "agree," "disagree," or are "neutral." We code our perception variables as (agree=1, neutral=0, disagree=-1) for these 10 items.

1. Vaccination reduces your own risk of infection (self-protection)
2. Vaccination can protect your family (people around you) from infection (protect others)
3. The safety of the vaccine has not been confirmed (safe concern)
4. Worried about side effect from vaccination (side effects concern)
5. No time to go for vaccination (time concern)

6. Difficult to make and keep appointments for vaccinations (reservation system)
7. Do not infect yourself or do not become seriously ill (no infection)
8. Covid is not serious enough to warrant vaccination (no covid)
9. basic infection prevention measures are sufficient without vaccination (mask)
10. Many people have already been vaccinated and so no need to be vaccinated (no need)

2.4. *Social Capital*

There were many previous studies on social capital since Hanifan (1916) coined the term (Putnam et al., 1993; Coleman, 1988; Bourdieu, 1986). Social capital refers to resources of community trust, collaboration, and regional engagement that create social bonds between individuals and society, which functions to enhance efficiency within society.[11] In our context, we hypothesize that social capital resulted in a rapid and high take-up of vaccination, relying on mutual cooperation and without resorting to mandates and the application of power by the state.

We construct three variables to measure social capital. Following the Putnam et al. (1993) framing, we define trust as: (1) trust in other people ("Trust people"); (2) willingness and belief in mutual help ("Reciprocity"); and (3) disposition to cooperate and contribute to one's community ("Regional coop"). In the wave 6 questionnaire, trust in other people is measured by the average score of two statements: "In general, we can trust other people," and "We can trust our neighbors." Mutual help is measured by the average score of two statements: "People must help each other," and "If you help others, they will help you when needed." Cooperation is measured by the response to the statement: "Local resources must be protected through collaboration of all local residents." For each statement, respondents were asked to state if they strongly agree (=5), agree (=4), neutral (=3), disagree (=2), or strongly disagree (=1). We then take average score of these three dimensions of social capital - i.e., trust, mutual help, and cooperation.[12] Table 2 describes the breakdown of the survey responses with regards to social capital in more detail.

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[11] Most famously, Putnam et al. (1993) argued that the reason why northern Italy developed faster than southern Italy is its abundant endowments of social capital, which, in their framing refers to trust of others, reciprocity, and local cooperation. In that case, they argued, social capital enhanced the efficient organizing of society.

[12] We note that the survey asked social capital as of pre-Covid, as well at the time of the survey; our paper uses the latter. Our social capital framework is very similar to Yodo (2018) who defined the three dimensions of social capital similarly. Other similar frameworks applied in the Japanese context can be found in Kawachi et al. (2011) and Hamano et al. (2009).

2.5. Trust in Government

The Wave 6 survey asked respondents about changes in their trust toward (1) the central government (“government trust”), (2) local government (“local government trust”), and (3) the medical system (“medical system trust”), compared to 2019 (the pre-pandemic period). Respondents were asked to select one of the following options regarding their change in trust in these three dimensions: “large increase (=5),” “increase (=4),” “no change (=3),” “decrease (=2),” or “large decrease (=1).”

2.6. Health Conditions and Other Health Indicators

The survey asked about respondents’ existing illnesses (“existing illness”), Covid-19 infection (“own Covid infection”), and mental health during the pandemic (“mental illness”), as well as any family infections of Covid-19 (“family Covid infection”). These variables are recorded as binary variables (1 if these items were recorded). In addition, the survey asked respondents about their fear of Covid-19 infection (“fear infection”). Respondents were asked to choose from the following option: "always (=4)," "often (=3)," "sometimes (=2)," "a little bit (=1)," or "not at all (=0)." Additionally, the survey inquired about side effects experienced after previous vaccinations, such as fever (defined as higher than 37.5°C), headache, pain, fatigue, other symptoms, or no symptoms. We constructed a dummy variable for side effects (“side effect”): no side effects (=0) and some/any side effects (=1). It is important to note that respondents who had never been vaccinated were assigned a value of zero (no side effects).

Finally, each wave also included the K6 questionnaire which measures six aspects of mental health. K6 is a mental health screening tool designed to monitor psychological distress, as proposed by Kessler et al. (2003).[13] A higher K6 score indicates worse mental health. By comparing responses from waves 5 and 6, we construct a variable for changes in each respondent's mental health condition (“change K6”).

2.7. Other questions

[13] The K6 has been translated into multiple languages, including Japanese. We use questionnaire in Japanese version (Furukawa et al., 2008).

Teleworking may reduce the incentive to vaccinate by eliminating the need for commuting, whereas the intention to commute and not work remotely could encourage vaccination. We include a telework binary indicator for whether a respondent engaged in teleworking at least one day during the fourth week of January 2022 ("teleworking") in wave 6. During the Covid-19 pandemic, people were strongly encouraged to work from home, but some occupations and work environments were not suitable for teleworking (Okubo, 2022).

Additionally, some teleworkers experienced lower productivity and reduced job performance. As a result, some people were eager to return to their place of work, as they did before the pandemic, which may have increased their motivation to get vaccinated. In wave 4, the survey asked respondents about their preferences for commuting and teleworking in the post-Covid era. First, respondents were asked to select their preferred work style after the pandemic from the following options: (1) want to commute every day, (2) want to commute 3 to 4 days per week, (3) want to split time equally between commuting and teleworking, (4) want to telework 3 to 4 days per week, or (5) want to telework every day. Higher values indicate a greater desire to telework, which is a variable for willingness to teleworking, "willingness of teleworking".

Respondents who preferred teleworking for more than one day per week were then asked a follow-up question: if your employer offered additional salary to persuade you to commute every day after the pandemic, how much additional salary would you expect? The question was framed with a reference to a monthly salary of 400,000 yen.[14] We construct a variable as "money to receive for commuting".

Wave 6 also asked about changes in respondents' daily lives since the previous survey wave (Life change variables). This part included questions about working hours, time devoted to housekeeping, sleep, and leisure, income, expenditure, workload, job satisfaction, and life happiness. Respondents were asked to choose from the following: largely decrease, decrease, no change, increase, or largely increase.

3. Estimation method

3.1. Objective behavior and subjective opinion about the vaccine

[14] At the time the question was asked, this was about US$ 3,000.

We first investigate how social capital affects vaccination behavior and opinion about the vaccine. Using ordered logit, we regress

$$prob(Y_i) = \phi(\beta X_i \ + \gamma Z_i \ + \varepsilon_i) \qquad [1]$$

where for the dependent variable (Y_i), we start with "$vacination_i$" as the vaccination behavior indicator (0-5) that denotes the respondent's commitment to the vaccination campaign (from zero as set as no intention to vaccinate to 5 denoting the respondent has already received the third dose), as discussed in section 2-2. X_i is the sets of variables we are focused on as determinants of the decision to vaccinate measures social capital, trust in government, perceived fear of infection, own and family infection history, own mental health due to the pandemic, and concurrent illnesses. Z_i is a vector of demographic and personal traits (gender, age, income, education, ICT skill, and teleworking), including occupation and firm-size fixed effects.

We then re-specify the dependent variable (Y_i) as "$percep_i$ " where this is a vector of measures about the respondent's perception of the vaccine (1=agree, 0=neutral, and -1=disagree). This variable includes above mentioned 10 questions about their views of the vaccination campaign, i.e. self-protection to no need of vaccination (section 2.3). Using ordered logit, we regress

$$prob(percep_i) = \phi(\beta X_i \ + \gamma Z_i \ + \varepsilon_i) \qquad [2]$$

Finally, we attempt to combine these two strands, [1] and [2], and estimate whether subjective views about the vaccine are at all related to the vaccination decisions that respondents actually make. Using the ordered logit estimation, we thus estimate the following specification:

$$prob(vacination_i) = \phi(\delta \, percep_i + \ \beta X_i \ + \gamma Z_i \ + \varepsilon_i) \qquad [3]$$

3.2. Changing views about the vaccination

As of wave 5 (September 2021), the maximum recommended vaccination regime was two doses, while between then and wave 6 (February 2022), the third dose was introduced and recommended. During this interval, it is possible that some people changed their mind on vaccination.

Using the information from waves 5 and 6, we investigate the change of views on vaccination for two groups: (1) those that were previously not willing to vaccinate (in wave 5), but some of them have changed their views and decided to vaccinate by wave 6, and (2) those that have already taken at least one dose of the vaccine in the runup to wave 5, but some of them have not taken any additional doses since then. The former one is to express a binary indicator for starting to vaccinate ("Start") and the latter one is a binary indicator for stopping to vaccinate ("Stop"). For these, we estimate a probit model. For this model, we also add a set of life change variables that denote life changes (changes of working hours, housekeeping hours, sleeping hours, leisure hours, income, amount of task, job satisfaction, life happiness, expenditure, and mental health) experienced by the respondents between wave 5 and wave 6 (see Section 2-7). In addition, we add the number of new infections at municipality level as of September 2021 ("Covid 21 Sept").

$$prob(change_i) = \phi(\alpha + \beta X_i + \gamma Z_i + \delta Life_i + \varepsilon_i) \qquad [4]$$

where "$change_i$" denotes either a binary indicator for starting vaccination ("Start") or stopping vaccination ("Stop") as mentioned above.

4. Results

We first examine the estimations result from a model that explains the decision to vaccinate (equation [1]) in Table 3. The specifications include first the ones including only the benchmark social capital variables and socio-demographic controls (column 1). It then adds occupation, firm-size, and employment sector fixed effects (column 2), a set of trust measures (column 3), a set of health measures (column 4), and additional controls for the willingness

to work remotely and subsidization of that work in columns 5 and 6 (we note that these last two questions include many missing responses which reduces the sample by about a third).

Overall, the picture that emerges from the regressions in Table 3 appears to be quite consistent. Social capital matters, in particular, the trust that people have in other people in their community (trust people), and their willingness and belief in the need for mutual help (reciprocity). The more ill-defined dimension of social capital – cooperation within the community (regional coop)– does not seem to be associated with the vaccination decision. The trust-in-government variables are not statistically significant, except (maybe not surprisingly) for trust in the medical/health system. We can also note that the magnitude of this association between trust-in-people and reciprocity, and the vaccination decision, is less pronounced once we control for the full set of covariates, but it remains statistically significant even in columns 5-6. Furthermore, there are no noticeable differences in terms of the size of these coefficients once the full covariate list is included.

Perhaps less trivially, we also find that facing mental health challenges, and having been infected by Covid-19 previously, are both associated with less willingness to receive the vaccine. From a public health perspective, these results may be important, but exploring their implications remains beyond what is feasible with the survey data we have.

Some other variables that are included in the specifications as controls – age, education – were positively associated with vaccinations, as was the fear of infection, and more surprisingly, the experience of side effects. Finally, in columns 5 and 6 we observe that people who viewed remote working more favourably were less willing to vaccinate, as were people who thought they would require higher compensation to be convinced not to tele-commute.

In an appendix (Appendix Table 2), we detail the results we obtained for the fixed effects for the Table 3 estimates. These find that people who work in larger firms or in the public sector are more likely to vaccinate, as are people who work in the health and social service sectors (this association was quite large). There were several other sectors that were associated, more weakly, with a lower propensity to vaccinate. The self-employed were also less likely to vaccinate.

In the next set of specifications (equation [2]), in Table 4, we present estimations that examine the association between respondents' ten views about the vaccinations, self-protection to no need of vaccination (section 2-3) and the social capital measures we described before. These views about vaccinations can be divided into three parts: (1) The perceived benefits of

vaccinations (e.g., vaccine provides protection from infection for family members); (2) The perceived non-monetary costs of vaccinations (e.g., the side effects of the vaccine and time loss from messy reservation system); and (3) reasons why vaccinations are (un)necessary (e.g., masks provide sufficient protection, deny Covid).

As shown in Table 4, the first type of views (benefits – columns 1-2) is associated positively and significantly with reciprocity. People who place more importance on reciprocity tend to view vaccination as beneficial. The second type (costs – columns 3-6) the observed pattern of association is less clear and is more difficult to generalize. Each specific statement seems to be associated differently; what is interesting is that 'trust in others' is negative (though not always with statistical significance), and the reciprocity measure is inconsistently signed. For the third type of views (necessity – columns 7-10), the emerging association is more consistent. It is positive with the 'trust in others' variable, so that people who trust people more view these as more legitimate views; this is the opposite sign to the other results described in columns 1-6. Meanwhile, both reciprocity and regional cooperation are consistently negative and statistically significant.

The main insight we conclude from the results described in Table 4 is that the association between social capital and vaccination behavior is mediated by the ways people view the vaccination, and those views are inconsistently related to social capital. Thus, people who have high social capital can believe less in the arguments that suggest the vaccine is unnecessary, and also believe the arguments that it is beneficial, but have a less clear views about the associated costs of undertaking vaccination.

In further investigation, presented in Table 5, we examine the association between these ten views (about the benefits, costs and necessity of the vaccine) and the decision to vaccinate (equation [3]). The 'benefit' views are positively associated with vaccination behavior, the 'cost' views are negatively associated with vaccination behavior, and the neutral 'unnecessary' views do not show a consistent pattern. We note that some basic variables, socio-demographic controls (age, income, sex, ICT skill, and education), a set of trust measure, and a set of health measure such as in column 4 of Table 3 are all included in the estimation, but Table 5 omitted them to report due to limited space.

Table 6 looks at the reasons some people change their plans with respect to vaccination (equation [4]). Between wave 5 and wave 6, some respondents decide to start to vaccinate (late in the vaccination campaign), in Column 1, and some decide to no longer vaccinate, in

Column 2. In Column 1, we see that people that decide to ultimately start vaccinating (as the third dose is already available) are people who increased working hours, receive higher income, and their life happiness is lower between wave 5 and wave 6. These people also seem to trust people more than those who continue not to vaccinate. For the opposite change, people who decide to stop vaccinating, having already received at least one dose of the vaccine, are more satisfied with their work, and, intriguingly, trust people and their community's reciprocal feeling of trust significantly less.

5. Conclusions

What can we conclude from our results? We mostly found support, in the Japanese data, for the view that social capital matters for the vaccination decision; and that it matters even once we control for institutional trust (especially trust in the medical system). However, this general association between trust in other community members, trust in the willingness of community members to engage in reciprocal assistance, and trust in the more general willingness of the community to support individuals, were all associated differently with the vaccination decision, and with the views about vaccinations (which we divided into views about the benefits, the costs, and the necessity of vaccination).

In Japan, trust in government, and in government actions associated with the pandemic lockdowns, were not associated with the decision to vaccinate. However, trust in the other members of the community remains a statistically important determinant of vaccination decision even once trust in the medical system was accounted for. From a policy perspective, this suggests that the Japan case both exposes the relevance of trust in government, in other circumstances, but also shows that intra-community trust (i.e., social capital), is important even in contexts when governmental trust is not a significant issue.

Overall, we can conclude that a safer way to deal with the public health campaign associated with a new vaccination campaign should also be considering the various facets of social capital. This insight, therefore, would support the view that for this reason, and indeed for many others, social capital should be deliberately created and maintained, so that policymakers can adequately use it when a crisis requires it.

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Table 1: Vaccine Behavior

		wave 6						
		Done third dose	Will take third dose soon	Took the second dose but not want to take third	Took the first dose but not want to take the second	Want to take vaccine but not yet	Will Not take vaccine	**Total**
wave 5	Done second dose	536	2970	318	33	10	41	**3908**
	Done first dose	8	890	170	20	10	20	**1118**
	Will take the first dose in the future	9	982	282	21	104	82	**1480**
	Will not take vaccination	13	165	133	20	63	626	**1020**
Total		**566**	**5007**	**903**	**94**	**187**	**769**	**7526**

Note: The shaded results are not internally consistent in their responses.

Table 2: Measures of Social Capital

	Questions in the survey		Disagree	Weakly disagree	neutral	Weakly agree	Agree
1	I can trust people	before Covid	538	1320	5625	2352	278
		current	619	1507	5691	2048	248
2	I can trust neighbouring people	before Covid	504	1135	5966	2220	288
		current	536	1190	5981	2123	283
3	People must help each other	before Covid	234	595	4689	3747	848
		current	263	598	4530	3690	1032
4	If I help others, they will help me	before Covid	428	935	5528	2708	514
		current	475	1028	5472	2590	548
5	Local resources should be protected by the community	before Covid	334	678	6482	2201	418
		current	346	727	6459	2141	440

Note: From wave 6 responses.

Table 3: Regression Results – Vaccination Behavior

VARIABLES	(1) vaccination	(2) vaccination	(3) vaccination	(4) vaccination	5 vaccination	6 vaccination
trust_people	0.0464	0.0587	0.0759**	0.104***	0.119**	0.124**
	(1.259)	(1.584)	(2.011)	(2.749)	(2.520)	(2.484)
reciprocity	0.236***	0.223***	0.206***	0.161***	0.134***	0.132**
	(6.245)	(5.811)	(5.245)	(4.106)	(2.681)	(2.518)
Regional coop	-0.0370	-0.0276	-0.0341	-0.0425	-0.0390	-0.0575
	(-1.064)	(-0.785)	(-0.958)	(-1.202)	(-0.852)	(-1.167)
government_trust			-0.0296	0.00204	0.0268	0.0533
			(-0.608)	(0.0432)	(0.463)	(0.877)
local_government_trust			0.0156	0.0256	-0.00551	-0.0196
			(0.291)	(0.499)	(-0.0853)	(-0.285)
medical_system_trust			0.109***	0.0880**	0.125**	0.139**
			(2.718)	(2.244)	(2.474)	(2.536)
existing_illness				0.102	0.0957	0.192**
				(1.407)	(1.103)	(2.084)
mental_illness				-0.440***	-0.527***	-0.570***
				(-3.664)	(-3.513)	(-3.548)
own_Covid infection				-0.541***	-0.389***	-0.338***
				(-6.507)	(-3.804)	(-3.090)
family_Covid infection				-0.0304	-0.117	-0.0335
				(-0.275)	(-0.826)	(-0.225)
ICT skill	0.0296	0.0330	0.0389	0.0542*	0.0900**	0.0887**
	(1.092)	(1.031)	(1.197)	(1.689)	(2.259)	(2.095)
teleworking			0.0289	0.0630	0.0438	0.00584
			(0.472)	(1.037)	(0.577)	(0.0699)
sex	0.180***	0.0588	0.0527	0.0573	0.0791	0.0774
	(3.884)	(1.135)	(1.008)	(1.093)	(1.204)	(1.111)
age	0.167***	0.189***	0.188***	0.176***	0.189***	0.187***
	(19.69)	(20.50)	(19.99)	(18.52)	(15.32)	(14.44)
education	0.0985***	0.0510**	0.0550**	0.0520**	0.0959***	0.114***
	(4.158)	(2.018)	(2.163)	(2.047)	(3.096)	(3.438)
income	-0.00294	-0.0189***	-0.0200***	-0.0139**	-0.0107	-0.00959
	(-0.477)	(-2.961)	(-3.116)	(-2.168)	(-1.393)	(-1.141)
fear_infection			0.181***	0.195***	0.179***	0.200***
			(9.899)	(10.60)	(7.865)	(8.178)
Side effect			0.735***	0.745***	0.760***	0.759***
			(14.38)	(14.46)	(12.39)	(11.70)
Willingness of Teleworking					-0.0880***	
					(-4.353)	
Money receive for commuting						-0.0506***
						(-3.792)
Observations	9,341	9,341	9,341	9,341	6,427	5,663
Pseudo R-2	0.0281	0.0611	0.0733	0.0793	0.0814	0.0822
Wald chi2	533.49	1006.66	1269.72	1443.26	1269.18	1144.88
Log pseudolikelihood	-10133.611	-9789.6047	-9663.2835	-9600.1509	-6443.6626	-5690.7355
Occupation, firm, and employment status FE	No	Yes	Yes	Yes	Yes	Yes

Table 4: Regression Results – Vaccination Perceptions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	BENEFIT		COST				NECESSITY			
VARIABLES	Self protect	Other protect	safety concern	Side effect concern	Time concern	reserve system	confidence of no infection	No covid	mask is enough	other vaccinated so no need
trust_people	-0.0443	-0.0452	-0.181***	-0.313***	-0.0125	-0.151***	0.174***	0.172***	0.118***	0.148***
	(-1.049)	(-1.091)	(-4.764)	(-7.878)	(-0.314)	(-4.016)	(4.563)	(4.451)	(2.987)	(3.692)
reciprocity	0.481***	0.519***	0.00313	0.322***	-0.408***	-0.0534	-0.307***	-0.318***	-0.363***	-0.460***
	(11.03)	(11.97)	(0.0788)	(7.733)	(-9.789)	(-1.342)	(-7.624)	(-7.932)	(-8.964)	(-11.04)
regional coop	0.0375	0.0427	-0.0462	0.0420	-0.138***	-0.0860**	-0.137***	-0.137***	-0.119***	-0.131***
	(0.941)	(1.089)	(-1.223)	(1.107)	(-3.517)	(-2.311)	(-3.661)	(-3.658)	(-3.090)	(-3.422)
Gov _trust	-0.102**	-0.0981**	-0.114**	-0.223***	0.188***	-0.0278	0.291***	0.177***	0.159***	0.303***
	(-1.961)	(-1.972)	(-2.393)	(-4.735)	(3.899)	(-0.609)	(6.077)	(3.824)	(3.404)	(5.980)
local_gov_trust	0.00815	-0.00342	-0.172***	-0.162***	0.00675	-0.0996*	0.00767	0.0616	0.0829	0.0289
	(0.138)	(-0.0605)	(-3.171)	(-3.086)	(0.122)	(-1.913)	(0.139)	(1.137)	(1.523)	(0.508)
med_system_trust	0.228***	0.214***	-0.117***	-0.0192	-0.231***	-0.0949**	-0.340***	-0.400***	-0.403***	-0.294***
	(4.781)	(4.669)	(-2.767)	(-0.464)	(-5.234)	(-2.227)	(-7.881)	(-8.895)	(-9.107)	(-6.530)
existing_illness	0.0986	0.208***	0.0899	0.110	-0.352***	-0.164**	-0.412***	-0.442***	-0.372***	-0.459***
	(1.196)	(2.601)	(1.262)	(1.513)	(-4.415)	(-2.285)	(-5.404)	(-6.075)	(-4.989)	(-5.630)
mental_illness	-0.393***	-0.547***	-0.210*	-0.0867	0.316***	0.277**	0.340***	0.255**	0.127	0.347***
	(-3.122)	(-4.567)	(-1.766)	(-0.803)	(2.633)	(2.470)	(2.646)	(2.120)	(1.064)	(2.893)
own_Covid infection	-0.763***	-0.684***	-0.187**	-0.614***	0.433***	-0.147**	0.649***	0.434***	0.478***	0.756***
	(-10.20)	(-9.315)	(-2.511)	(-8.977)	(6.114)	(-2.353)	(8.472)	(5.989)	(6.541)	(10.69)
family_Covid infection	0.385***	0.264**	0.129	-0.000	0.262**	0.00126	-0.0266	0.245**	0.253**	0.0601
	(3.126)	(2.214)	(1.139)	(-0.001)	(2.303)	(0.0118)	(-0.219)	(2.138)	(2.218)	(0.519)
ICT skill	0.149***	0.132***	0.0731**	0.120***	-0.0626**	0.0440*	-0.0513*	0.0155	-0.00399	-0.0513*
	(4.804)	(4.313)	(2.551)	(4.339)	(-2.207)	(1.708)	(-1.832)	(0.567)	(-0.145)	(-1.803)
teleworking	0.387***	0.335***	0.124**	0.206***	-0.000223	0.238***	0.0899	0.0734	0.107*	0.0804
	(5.625)	(5.107)	(2.034)	(3.437)	(-0.00367)	(4.104)	(1.469)	(1.197)	(1.763)	(1.292)
sex	0.180***	0.170***	0.267***	0.495***	-0.00857	0.110**	-0.109**	-0.149***	-0.149***	-0.109**
	(3.489)	(3.390)	(5.612)	(10.20)	(-0.173)	(2.378)	(-2.256)	(-3.128)	(-3.088)	(-2.187)
age	0.132***	0.125***	-0.0511***	-0.0558***	-0.139***	-0.0849***	-0.0479***	-0.0860***	-0.114***	-0.0901***
	(14.33)	(13.90)	(-5.904)	(-6.489)	(-15.68)	(-10.25)	(-5.543)	(-10.15)	(-13.09)	(-10.16)
education	0.0449*	0.0474*	-0.0514**	-0.00678	-0.0373	-0.000895	-0.0292	-0.0182	-0.0391*	-0.0480**
	(1.792)	(1.937)	(-2.236)	(-0.297)	(-1.587)	(-0.0411)	(-1.274)	(-0.810)	(-1.738)	(-2.068)
income	-0.0222***	-0.0135**	-0.00145	-0.00945*	0.0229***	0.0112**	0.0207***	0.0181***	0.00941*	0.0239***
	(-3.943)	(-2.384)	(-0.263)	(-1.766)	(3.997)	(2.167)	(3.621)	(3.303)	(1.708)	(4.148)
Pseudo R-2	0.0705	0.0716	0.0239	0.0450	0.0722	0.0266	0.0397	0.0454	0.0534	0.0642
Wald chi2	1007.05	1055.84	397.95	795.22	1152.89	484.96	629.93	769.11	846.73	992.24
loglikelihood	-7528.650	-7735.741	-9059.053	-8917.900	-8227.779	-9912.444	-8463.079	-8703.436	-8559.672	-8024.185

Note: All regressions include occupation, firm size, and employment status fixed effects. They all include the full sample size (9,341).

Table 5: Regression Results – Vaccination Behavior and Perceptions

VARIABLES	(1) Vaccination
self-protection	0.971***
	(17.09)
protect others	0.595***
	(10.52)
safety concern	-0.198***
	(-4.503)
side effect concern	-0.146***
	(-3.625)
time concern	-0.223***
	(-5.148)
reserve system concern	-0.0522
	(-1.441)
confidence of no infection	0.231***
	(4.987)
no covid	-0.124**
	(-2.365)
mask is enough	-0.580***
	(-11.03)
no need	-0.0619
	(-1.414)
trust_people	0.0843**
	(2.102)
reciprocity	-0.0675
	(-1.594)
Regional_coop	-0.0621
	(-1.629)
Pseudo R-2	0.1912
Wald chi2	3986.59
loglikelihood	-8433.774

Note: regression includes occupation, firm size, and employment status fixed effects. They all include the full sample size (9,341). Other variables (socio-demographic controls, a set of trust measure and a set of health measure such as specification in column 4 of Table 3) are included in the regression, but they are omitted to report in Table.

Table 6: Regression Results – Changing Vaccination Behavior

VARIABLES	(1) Start	(2) Stop
Δworking hours	-0.270*	-0.0593
	(-1.835)	(-0.873)
Δhousekeeping hours	-0.0500	0.111
	(-0.350)	(1.602)
Δsleeping hours	-0.0816	-0.102
	(-0.551)	(-1.472)
Δleisure hours	0.151	0.0554
	(1.168)	(0.892)
ΔIncome change	0.277**	-0.0108
	(2.247)	(-0.164)
Δamount of task	0.172	-0.0651
	(1.191)	(-1.036)
Δjob satisfaction	-0.0574	0.179***
	(-0.443)	(2.609)
Δlife happiness	-0.284**	-0.0169
	(-2.138)	(-0.251)
Δexpenditure	-0.0905	-0.0543
	(-0.897)	(-0.955)
Δmental health	0.0925	-0.00385
	(0.810)	(-0.0617)
Change K6	-0.0798	0.0211
	(-1.517)	(0.832)
trust_people	0.254**	-0.137**
	(2.509)	(-2.361)
reciprocity	-0.144	-0.185***
	(-1.258)	(-3.124)
Regional coop	0.108	0.0316
	(1.032)	(0.596)
government_trust	-0.0305	0.158**
	(-0.233)	(2.236)
local_government_trust	-0.0130	-0.00904
	(-0.0860)	(-0.117)
medical_system_trust	0.00198	-0.120*
	(0.0147)	(-1.941)
existing_illness	-0.779***	-0.187
	(-2.718)	(-1.577)
mental_illness	0.364	0.399**
	(1.064)	(2.421)
own_Covid infection	-0.0667	0.463***
	(-0.280)	(4.166)
family_Covid infection	0.979***	0.0984
	(2.845)	(0.591)
ICT skill	-0.0128	-0.0419
	(-0.149)	(-0.859)
teleworking	-0.163	0.0266
	(-0.798)	(0.281)
sex	-0.135	-0.188**
	(-0.936)	(-2.365)
age	-0.00215	-0.0262*
	(-0.0711)	(-1.790)
education	0.0490	-0.00918
	(0.701)	(-0.233)
income	-0.00334	0.00824
	(-0.193)	(0.883)
fear_infection	0.0946*	-0.0509*
	(1.771)	(-1.717)
sideeffect	-	-0.494***
		(-4.429)
covid21sep1	6.497*	-0.520
	(1.748)	(-0.219)
Observations	524	3,511
R-2	0.1299	0.1203
LR Chi-2	89	231.94
Log likelihood	-298.09966	-848.36315

Note: regressions include occupation, firm size, and employment status fixed effects

Appendix Table 1: Basic Statistics

stats	N	mean	min	max
vaccination	9585	3.445175	0	5
self_protect	9585	0.535733	-1	1
other_protect	9585	0.502765	-1	1
safety concern	9585	0.065519	-1	1
side_effect concern	9585	0.341784	-1	1
time concern	9585	-0.42984	-1	1
reserve system	9585	-0.03036	-1	1
no_infection	9585	-0.3687	-1	1
no_covid	9585	-0.323	-1	1
mask is enough	9585	-0.37194	-1	1
no_need	9585	-0.47846	-1	1
trust_people	10113	3.011174	1	5
reciprocity	10113	3.313359	1	5
regional coop	10113	3.15841	1	5
government trust	10113	2.764066	1	5
local_government trust	10113	2.833284	1	5
medical system trust	10113	2.981707	1	5
existing_illness	10113	0.123208	0	1
mental_illness	10113	0.056462	0	1
own_covid infection	10113	0.115495	0	1
family Covid infection	10113	0.051617	0	1
stop	6310	0.073376	0	1
start	1078	0.419295	0	1
sex	10113	1.448037	1	2
age	10113	7.938001	2	12
education	10113	3.292693	1	6
income	10113	5.384307	0.25	21.25
ICT skill	9830	1.331536	0	3
teleworking	10113	0.167408	0	1
fear_infection	10113	1.508356	0	4
side effect	10113	0.165332	0	1

Appendix Table 2: Fixed effects in Table 3

		(2)	(3)	(4)
Firm size: reference 1-4 employees				
	5-29 employees	0.0168	0.0265	0.0555
		(0.164)	(0.263)	(0.552)
	30-99 employees	0.126	0.136	0.200*
		(1.192)	(1.303)	(1.918)
	100-499 employees	0.142	0.141	0.181*
		(1.355)	(1.353)	(1.737)
	More than 500 employees	0.169*	0.197*	0.235**
		(1.666)	(1.941)	(2.329)
	Government and public	0.201	0.218	0.246*
		(1.488)	(1.615)	(1.835)
employment status: reference regular workers				
	non-regular	-0.124**	-0.116*	-0.112*
		(-2.120)	(-1.959)	(-1.894)
	employers	-0.0537	-0.0833	-0.0809
		(-0.337)	(-0.537)	(-0.537)
	self-employment w employee	-0.386**	-0.359**	-0.271*
		(-2.454)	(-2.321)	(-1.770)
	self-employment w/o employee	-0.52***	-0.48***	-0.47***
		(-4.223)	(-3.943)	(-3.876)
	home work and family business	-0.85***	-0.77***	-0.71***
		(-4.165)	(-3.794)	(-3.576)

		(2)	(3)	(4)
Occupation: reference 1: administrative and managerial				
2	Researchers	-0.343	-0.281	-0.209
		(-1.603)	(-1.301)	(-1.003)
3	Agricultural engineers	-0.0850	-0.122	-0.109
		(-0.192)	(-0.282)	(-0.259)
4	Manufacturing engineers	-0.207*	-0.223*	-0.223*

		(-1.720)	(-1.831)	(-1.860)
5	Architects, civil engineers	-0.35***	-0.40***	-0.326**
		(-2.679)	(-3.091)	(-2.508)
6	Data processing	-0.159	-0.152	-0.152
		(-1.356)	(-1.275)	(-1.283)
7	Doctors, dentists	2.362***	2.421***	2.410***
		(8.445)	(8.464)	(8.536)
8	Public health nurses	2.507***	2.515***	2.506***
		(9.247)	(8.950)	(9.054)
9	Medical Technology Professionals	2.267***	2.307***	2.296***
		(9.051)	(8.953)	(9.078)
10	Social welfare workers	0.917***	0.869***	0.922***
		(3.760)	(3.542)	(3.843)
11	Legal Professionals	-0.494*	-0.504*	-0.374
		(-1.756)	(-1.718)	(-1.302)
12	Finance and insurance	0.0847	0.0876	0.116
		(0.302)	(0.309)	(0.413)
13	Management Business consultants	0.222	0.143	0.267
		(0.595)	(0.397)	(0.783)
14	Teachers	0.0190	0.00843	-0.0339
		(0.126)	(0.0563)	(-0.228)
15	Religions	-0.0652	-0.453	-0.231
		(-0.053)	(-0.380)	(-0.195)
16	Authors, journalists, editors	-0.136	-0.0724	-0.129
		(-0.360)	(-0.191)	(-0.339)
17	Artists, designers, photographers	-0.270	-0.257	-0.287
		(-1.228)	(-1.176)	(-1.317)
18	Other specialist professionals	0.231	0.204	0.197
		(1.104)	(0.965)	(0.953)
19	General clerical	-0.0896	-0.118	-0.158*
		(-0.953)	(-1.253)	(-1.688)
20	Accountancy	-0.0832	-0.0868	-0.115
		(-0.558)	(-0.578)	(-0.770)
21	Production-related clerical	-0.237	-0.255	-0.250
		(-1.204)	(-1.241)	(-1.230)

22	Sales clerks	-0.213*	-0.242**	-0.260**
		(-1.887)	(-2.132)	(-2.313)
23	Outdoor service	-0.0820	-0.213	-0.209
		(-0.161)	(-0.429)	(-0.485)
24	Transport and post clerical	-0.528**	-0.575**	-0.62***
		(-2.333)	(-2.536)	(-2.726)
25	Office appliance operators	-0.745*	-0.913**	-1.006**
		(-1.709)	(-2.147)	(-2.388)
26	Sales workers	-0.251**	-0.272**	-0.30***
		(-2.313)	(-2.492)	(-2.814)
27	Family Life Support & Care Service	1.240***	1.258***	1.249***
		(5.329)	(5.238)	(5.151)
28	Occupational health and hygiene	0.791**	0.784**	0.761**
		(2.121)	(2.074)	(2.026)
29	Food and drink cooking	-0.0434	-0.0291	-0.0419
		(-0.287)	(-0.195)	(-0.283)
30	Residential facilities and buildings	0.163	0.113	0.131
		(0.679)	(0.441)	(0.529)
31	Other service workers	-0.137	-0.163	-0.161
		(-1.165)	(-1.384)	(-1.365)
32	Security workers	0.186	0.127	0.137
		(0.639)	(0.428)	(0.468)
33	Agriculture, forestry and fishery	0.0799	0.0228	0.166
		(0.315)	(0.0920)	(0.689)
34	Manufacturing process	-0.224*	-0.217*	-0.244*
		(-1.738)	(-1.663)	(-1.878)
35	Transport and machine operation	-0.0305	-0.0451	-0.0670
		(-0.148)	(-0.224)	(-0.332)
36	Construction and mining	-0.606**	-0.616**	-0.635**
		(-2.086)	(-2.131)	(-2.112)
37	Carrying, cleaning, packaging	-0.206	-0.242	-0.248
		(-1.271)	(-1.506)	(-1.544)
38	Other	-0.260**	-0.30***	-0.260**
		(-2.278)	(-2.678)	(-2.295)