COVID-19 Infection and Its Labor Supply Impact: Evidence from a Large-scale Survey in Japan

By

Asako Chiba
(Tokyo Foundation for Policy Research)

Shunsuke Hori
(Hitotsubashi University)

Taisuke Nakata
(The University of Tokyo)

Shusaku Sasaki
(Osaka University)

Reo Takaku
(Hitotsubashi University)

January 17, 2025

CREPE DISCUSSION PAPER NO. 164

CENTER FOR RESEARCH AND EDUCATION FOR POLICY EVALUATION (CREPE)
THE UNIVERSITY OF TOKYO
https://www.crepe.e.u-tokyo.ac.jp/

COVID-19 Infection and Its Labor Supply Impact: Evidence from a Large-scale Survey in Japan*

Asako Chiba† Shunsuke Hori‡ Taisuke Nakata§ Shusaku Sasaki¶
Reo Takaku||

January 17, 2025

Abstract

We conducted a large-scale retrospective survey to investigate how COVID-19 infection affected the labor outcomes of infected workers in Japan. Many infected workers—including those without any COVID-19 symptoms—experienced some reductions in hours worked or earnings immediately after infection. The negative labor impacts often lasted for more than a month. The negative labor impacts were particularly pronounced for contract workers, non-regular workers, workers without remote-work availability, and those unvaccinated. Our estimate based on the survey and other official statistics indicates that COVID-19 infection had a non-negligible negative impact on the aggregate labor supply in 2022.

*We thank Kazuhiro Teramoto for his insightful comments and Yuma Oshima, Kei Shimazawa, Haruka Toriibara, and Naoki Furukawa for their excellent research assistance. We are also grateful to the seminar participants at the Summer Workshop on Economic Theory and the AASLE conference. Taisuke Nakata was supported by JSPS Grant-in-Aid for Scientific Research (KAKENHI), Project Number 22H04927, the Research Institute of Science and Technology for Society at the Japan Science and Technology Agency, and the Center for Advanced Research in Finance at the University of Tokyo.

†Tokyo Foundation for Policy Research; Email: chiba@tkfd.or.jp
‡Hitotsubashi University; Email: s.hori@r.hit-u.ac.jp
§University of Tokyo; Email: taisuke.nakata@e.u-tokyo.ac.jp
¶Osaka University; Email: ssasaki.econ@cider.osaka-u.ac.jp
||Hitotsubashi University; Email: reo.takaku@r.hit-u.ac.jp

1 Introduction

Many countries experienced a sharp decline in economic activities in the initial phase of the pandemic, from which they only gradually recovered. Real GDP in April-June 2020 dropped from the previous year by 7.5 percent in U.S., 9.7 percent in Japan, and more than 10 percent in many European countries.[1] Various infection-control measures—including lockdown orders—likely played an important role in such declines in economic activities. Meanwhile, with so many workers getting infected and experiencing days of isolation as well as symptoms, COVID-19 infection itself might have played an important role in depressing economic activities via the supply channel. Yet, neither official statistics nor existing surveys give us any clues to understand the importance of this supply channel.

We conducted a large-scale retrospective survey to investigate how COVID-19 infection affected the labor outcomes of infected workers. In the survey, we identified workers who experienced COVID-19 infection at some point during the COVID-19 pandemic and asked them how their labor outcomes evolved after they got infected. We first characterize the labor impacts of infection by showing summary statistics. We then analyze how these labor impacts are related to workers' characteristics via regression analyses. Finally, we combine the information in our survey with other official statistics to estimate the aggregate labor supply reduction in Japan associated with COVID-19 infection.

Our main findings are as follows. First, many infected workers experienced reductions in hours worked and income following the infection. During the isolation period, nearly half of infected workers experienced reductions in hours worked, and more than a quarter experienced a reduction in income. Some infected workers suffered from reduced hours and income even after the isolation period, albeit to a smaller degree. Reductions in hours and income lasted for a few months on average. When infected workers experienced an income reduction, the size of the reduction was substantial: more than one third and more than one fourth during and after the isolation period, respectively. Interestingly, these negative labor impacts are present even for some workers without any symptoms; more than 10 percent of the infected workers without any symptoms experienced hours and income reduction after isolation.

Second, according to our regression analyses, these negative labor impacts were associated with certain job characteristics. Workers without remote work availability, contract workers, and non-regular workers were more likely to experience negative labor impacts, both during and after the isolation period. Consistent with other research, we find that female workers are more likely to experience negative labor impacts, albeit only during

[1] U.S. Bureau of Economic Analysis; OECD

the isolation period. Older workers, low-income workers, and less educated workers are also more likely to experience negative labor impacts during the isolation period.

Finally, we estimate that the effect of COVID-19 infection on the aggregate labor supply was very small in 2020 and 2021, but non-trivial in 2022. The reduction in hours worked per infected worker was smaller in 2022 than in 2020 and 2021. However, the number of infected workers was much higher in 2022 than in 2020 and 2021. With the latter factor dominating the former factor, the aggregate labor supply reduction associated with COVID-19 infection is larger in 2022 than in 2020 and 2021. The estimated reduction in the aggregate labor supply reduction in Japan is much smaller than that in the U.S. Although the reduction in hours worked per infected worker is larger in Japan than in the U.S., a substantially larger fraction of workers got infected with COVID-19 in the U.S. than in Japan.

Our study contributes to the literature on the labor market during the COVID-19 pandemic. Some researchers have documented the magnitude and persistence of the effects of the COVID-19 crisis on the labor market at micro and macro levels (Campello et al., 2020; Coibion et al., 2020; Faberman et al., 2022; Forsythe et al., 2020; Fukai et al., 2021; Su et al., 2022). Some researchers have emphasized the heterogeneity in the labor market outcomes (Adams-Prassl et al., 2020; Albanesi and Kim, 2021a; Albanesi and Kim, 2021b; Alon et al., 2020; Alon et al., 2022; Bluedorn et al., 2023; Coibion et al., 2020; Cortes and Forsythe, 2023; Kikuchi et al., 2021; Kotera and Schmittmann, 2022; Shibata, 2021), while others have focused on remote work (Bartik et al., 2020; Deole et al., 2023; Hansen et al., 2023; Soh et al., 2024), the decline in the labor force participation rate (Abraham and Rendell, 2023; Faberman et al., 2022; Lee et al., 2023), and the effect of lockdown or quarantine policies (Baek et al., 2021; Bartik et al., 2020; Chetty et al., 2024; Chiba et al., 2025; Spiegel and Tookes, 2021). Our paper differs from these papers in that we focus on the effects of COVID-19 infection on the labor supply, as in Fischer et al. (2022) and Goda and Soltas (2022).

We complement other studies that estimate the aggregate labor supply reduction associated with COVID-19 infection. Many estimates are available for the U.S. (Abraham and Rendell, 2023; Bach, 2022a; Bach, 2022b; Goda and Soltas, 2022; McKinsey & Company, 2023). We estimate the aggregate hours lost associated with COVID-19 infection in Japan. To the best of our knowledge, this is the first estimate outside U.S.

Our survey also contributes to the literature on the symptoms of COVID-19. Researchers have conducted various surveys to investigate COVID-19 symptoms in various countries (Aiyegbusi et al., 2021; Alimohamadi et al., 2020; Cabrera Martimbianco et al., 2021; Çalıca Utku et al., 2020; Chopra et al., 2021; Jacobs et al., 2020). However, most surveys do not ask participants how infection affected their work in detail.[2] Our survey is unique because we ask detailed questions about the labor outcomes of infected workers following infection.

The rest of the paper is structured as follows: Section 2 describes how we obtained the data. Section 3 summarizes the descriptive statistics with regard to attribution and labor outcomes. Section 4 discusses heterogeneous labor impacts by conducting regression analyses. Section 5 estimates aggregate labor supply reduction because of the workers' getting infected with COVID-19. Section 6 discusses limitations of this study. Section 7 concludes.

2 Detail of the Survey

We conducted a survey from February 7, 2023 to February 16, 2023, in collaboration with Cross Marketing Inc., an online market research company based in Japan.[3][4] We restrict our attention to those who lived in Tokyo and were aged between 20 and 64 at the time of our survey. Our target was workers who had gotten infected with COVID-19 at least once during the COVID-19 crisis. We conducted a screening survey to identify those individuals who had a job in March 2020—right before the COVID-19 crisis intensified—and had gotten infected with COVID-19 at least once at the time of the survey. The distributions of gender and age were matched to those in the Population Census.

In the survey, we asked the respondents a wide range of questions. The questions can be roughly categorized into (i) demographic/socio-economic characteristics, (ii) medical experiences related to COVID-19 infection, and (iii) labor market outcomes following the infection.

For demographic/socio-economic characteristics, we asked the respondents their age, gender, education, income in 2019, whether they lived with the elderly—older than 64 years old—or infants—below school age—at the time of infection, drinking habits, smoking habits, and pre-existing health conditions. We asked them the type of employment—regular or non-regular workers; self-employed, part-time, or full-time—industry, and the availability of remote work.

[2] Chopra et al., 2021 and Jacobs et al., 2020 reports a substantial share of hospitalized workers could not return to work. Although, it is unknown how long and how much they reduced labor supply.

[3] They register their attributions and e-mail addresses to the company so that they can receive survey invitations. The company invited 162 thousand potential participants to the screening survey. The respondents who completed the main survey received a reward.

[4] This survey was approved by the University of Tokyo's Ethics Review Committee (Application No.22-382)

For medical experiences related to COVID-19 infection, we asked the respondents when they got infected with COVID-19 and asked them to select all symptoms they experienced among a list of ten symptoms. We also asked the duration of each symptom: we provided 11 choices ranging from '0 day' to 'more than 6 months,' with 0 days indicating that the infected worker did not suffer from the symptom. We also asked about their experience regarding the duration of being in hospital and being in isolation.

For labor market outcomes following the infection, we asked the respondents their labor outcomes during and after isolation.[5] We asked whether they had to reduce hours worked and income during isolation.[6] For those who reported a reduction, we further asked the percentage reduction in income relative to the level just before infection.[7] We then asked the same set of questions regarding the labor outcomes after the isolation period. For the labor outcomes after the isolation period, we also asked about the duration of the reduction in hours worked and income for those who faced continued reductions in hours worked or income after the isolation period.[8]

One important feature of our survey is that we asked about reductions in hours worked and income from their levels right before infection, as opposed to right before the COVID-19 crisis began. Many workers must have experienced changes in their hours worked and income during the COVID-19 crisis due to reasons unrelated to their personal infection experience—demand factors. Thus, if we had asked about reductions from levels that prevailed right before the COVID-19 crisis, those reductions may partly capture factors unrelated to infection. By asking the reduction from the level right before infection, we isolate the effects of COVID-19 infection on labor outcomes from the effects of other demand-related factors.

[5] Isolation is the stay-at-home requirement for a certain number of days after diagnosis. The duration of isolation was defined by the Ministry of Health, Labour, and Welfare. However, the duration defined was not always applied in reality. What our survey asks is each participant's labor outcomes during their isolation and after that.

[6] The income includes not only labor income but also other income such as subsidies.

[7] We do not ask the relative size of hours reduction but income reduction because people can hardly answer the change in their actual hours worked on a daily basis.

[8] We also asked them about job separation. However, we do not use the data on job separation in our analysis because the number of reports of having quitted/lost their jobs was very small.

3 Descriptive Statistics

3.1 Individual Characteristics

Table 1 shows the summary statistics on key demographic, socio-economic, and medical characteristics of our respondents. As we described in the previous section, the participants' age and sex are distributed closely to the residents in Tokyo by construction. Education distribution shows a larger share of university graduates than in official statistics: According to National Census, 26.0 percent of workers aged between 20 and 64 in Tokyo are junior-high/high school graduates, 63.3 percent are college/university graduates, and 7.1 percent are more highly educated. Income distribution is close to the official statistics: According to Statistical Survey of Actual Status for Salary in the Private Sector in 2021, 44.1 percent of workers in Tokyo earn less than 4 million yen and 41.0 percent earn between 4 and 8 million yen. Industry distribution is also close to official statistics: According to National Census, 0.4 percent of workers in Tokyo work in primary industry, 14.6 percent work in secondary industry, and 85.0 percent work in tertiary industry. Employment-type distribution is also close to the official statistics. According to Employment Status Survey, 57.6 percent of workers in Tokyo are permanently employed, 4.6 percent are non-permanently employed (contract workers), 23.3 percent are part-time workers, and 14.5 percent are self-employed or in other employment-type. These data suggest that the participants represent the residents in Tokyo reasonably well.

Although not shown in the table, among 9,765 effective samples, 77.7 percent are those who first got infected in 2022. This large share reflects an explosive increase in the number of cases from 2020 to 2022. As the survey captures the cases as of February 2023, only 8.9 percent are those who first got infected in 2023. Considering this small share, we do not use the data of those who got infected in 2023 in estimating macro impact as presented in Section 5.

3.2 Labor Outcome

Table 1 summarizes the labor outcomes during and after isolation. Overall, our survey indicates large negative impacts of COVID-19 infection on labor outcomes. During the isolation period, 45.4 percent and 25.4 percent of infected workers experienced reductions in hours worked and income, respectively. Conditional on experiencing a reduction in income, the average size of the income reduction is 59.2 percent. After the isolation period is over, 17.9 percent and 13.2 percent of infected workers had a continued reduction in hours worked and income from the previous month of their infection. Conditional on the

Table 1: Summary statistics

	Obs.
Age	
20-29	1,286 (13.2%)
30-49	5,297 (54.2%)
50-65	3,182 (32.6%)
Gender	
male	4,874 (49.9%)
female	4,891 (50.1%)
Live with elderly	
yes	1,342 (13.7%)
no	8,423 (86.3%)
Live with infants	
yes	1,634 (16.7%)
no	8,131 (83.3%)
Education	
Junior-high/High school	2,026 (20.7%)
College/University	6,944 (71.1%)
Graduate school	795 (8.1%)
Income in 2019	
$<$ ¥6 mil.	6,731 (68.9%)
$\geq$ ¥6 mil.	3,034 (31.1%)
Industry	
Primary	26 (0.3%)
Secondary	1,517 (15.5%)
Tertiary	8,222 (84.2%)
Employment type	
Permanent	5,874 (60.2%)
Contract	845 (8.7%)
Part-time	1,713 (17.5%)
Self-employed & Others	1,333 (13.7%)
Remote work	
Available	4,123 (48.9%)
Partly available	2,047 (24.3%)
Unavailable	2,262 (26.8%)
Total	9,765 (100.0%)

continued reduction in income, the average size of the income reduction is 39.1 percent. The reductions in hours worked and income lasted on average for 2.2 months and 3.1 months, respectively.

Looking at year-by-year variation, the negative impacts of COVID-19 infection became smaller from 2020 to 2022 for some labor outcomes. Regarding labor outcomes during the isolation period, while the share of workers experiencing hours reduction stays around 45 percent, the share of experiencing income reduction declined from 31.5 percent to 24.6

percent. The average size of income reduction stays around 58 percent. Regarding labor outcomes after isolation period, the share of experiencing hours reduction declined from 27.2 percent to 17.2 percent. The average duration of hours reduction became shorter from 5.2 months to 1.8 months. The share of workers experiencing income reduction declined from 20.8 percent to 12.4 percent. The average size of income reduction declined from 53.1 percent to 37.5 percent, whereas the average duration of income reduction declined from 7.7 months to 2.4 months.

Table 2: Labor outcomes by year

		Year of getting infected		
	Total	2020	2021	2022–2023
During isolation				
Hours reduction				
Yes	4,437 (45.4%)	169 (45.1%)	398 (42.3%)	3,870 (45.8%)
No	5,328 (54.6%)	206 (54.9%)	544 (57.7%)	4,578 (54.2%)
Income reduction				
Yes	2,478 (25.4%)	118 (31.5%)	286 (30.4%)	2,074 (24.6%)
No	7,287 (74.6%)	257 (68.5%)	656 (69.6%)	6,374 (75.4%)
Average size of income reduction [%]	59.2	58.5	56.2	59.6
After isolation				
Hours reduction				
Yes	1,752 (17.9%)	102 (27.2%)	195 (20.7%)	1,455 (17.2%)
No	8,013 (82.1%)	273 (72.8%)	747 (79.3%)	6,993 (82.8%)
Average duration of hours reduction [month]	2.2	5.2	3.2	1.8
Income reduction				
Yes	1,291 (13.2%)	78 (20.8%)	162 (17.2%)	1,051 (12.4%)
No	8,474 (86.8%)	297 (79.2%)	780 (82.8%)	7,397 (87.6%)
Average size of income reduction [%]	39.1	53.1	42.7	37.5
Average duration of income reduction [month]	3.1	7.7	5.2	2.4
Total	9,765 (100.0%)	375 (3.8%)	942 (9.6%)	8,448 (86.5%)

Size of income reduction, duration of hours reduction, and duration of income reduction shown here are statistics for those who reported a decline.

3.3 Symptoms and Labor Outcomes

Table 3 presents the labor outcome following infection, separately for the symptomatic and the asymptomatic.

The presence of symptoms makes it more likely for the infected workers to experience reductions in hours worked and income. During the isolation period, 46.4 percent and

25.8 percent of symptomatic workers experienced reductions in hours worked and income, respectively, as opposed to 27.0 percent and 18.3 percent of asymptomatic workers. After the isolation period, 18.3 percent and 13.4 percent of symptomatic workers experienced continued reductions in hours worked and income, respectively, as opposed to 11.9 percent and 10.7 percent of asymptomatic workers.

The size of the income reduction is larger for the symptomatic worker than for the asymptomatic workers during the isolation period. Interestingly, the size of the income reduction is larger, and the durations of reductions in hours worked and income are longer, for the asymptomatic workers than for the symptomatic workers.

The effects of COVID-19 infection on the labor outcome for asymptomatic workers likely capture the effects of the isolation policy and its scarring effects. They may also capture the possibility that an infected worker—even if they are asymptomatic—may have to care for their possibly symptomatic infected cohabitants if an infected worker is more likely to face infected cohabitants at the same time.

Table 3 shows the relation between the duration of symptoms on the one hand and the duration of the reduction in hours and income on the other. According to the figure, the longer the duration of the symptom is, the longer the reductions in hours worked and income are (see top and bottom panels, respectively). Interestingly, the duration of hours reduction and income reduction tends to be shorter than the duration of symptoms, suggesting that many workers had to return to their work in full capacity while still suffering from some COVID-19 symptoms.

Table 3: Labor outcomes by prevalence of symptoms

	Prevalence of symptoms		
	Total	Symptomatic	Asymptomatic
During isolation			
Hours reduction			
Yes	4,437 (45.4%)	4,301 (46.4%)	136 (27.0%)
No	5,328 (54.6%)	4,960 (53.6%)	368 (73.0%)
Income reduction			
Yes	2,478 (25.4%)	2,386 (25.8%)	92 (18.3%)
No	7,287 (74.6%)	6,875 (74.2%)	412 (81.7%)
Average size of income reduction [%]	59.2	59.5	51.5
After isolation			
Hours reduction			
Yes	1,752 (17.9%)	1,692 (18.3%)	60 (11.9%)
No	8,013 (82.1%)	7,569 (81.7%)	444 (88.1%)
Average duration of hours reduction [month]	2.2	2.2	2.9
Income reduction			
Yes	1,291 (13.2%)	1,237 (13.4%)	54 (10.7%)
No	8,474 (86.8%)	8,024 (86.6%)	450 (89.3%)
Average size of income reduction [%]	39.1	38.6	48.5
Average duration of income reduction [month]	3.1	3.0	4.3
Total	9,765 (100.0%)	9,261 (94.8%)	504 (5.2%)

Size of income reduction, duration of hours reduction, and duration of income reduction shown here are statistics for those who reported a decline.

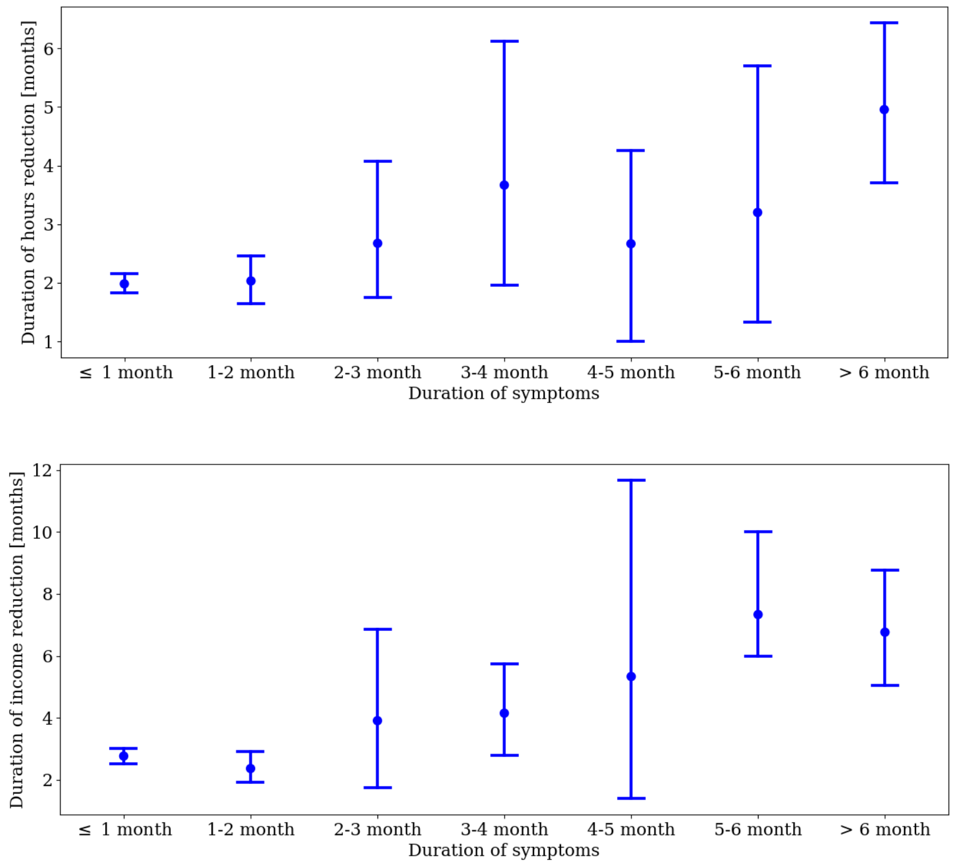

Figure 1: Duration of symptoms and the duration of the reduction in hours and income

4 Regression Analysis

4.1 Setup

We conduct regression analyses to understand factors associated with labor market outcomes following infection.

Some labor outcomes in our survey—whether an infected worker experienced reductions in hours worked or income—are binary. We use a dummy variable to capture these outcomes: the dummy variable takes the value of 1 if an individual i experienced a reduction in hours worked or income and the value of 0 otherwise. Other labor outcomes in our survey—the size of reduction in income and the duration of reductions in hours worked and income—take the form of a continuous variable. Regardless of whether the outcome variable is a binary or continuous, we estimate the following linear equation:

$$y_i = \boldsymbol{\beta}'\mathbf{x}_i + \epsilon_i,$$

where $\boldsymbol{\beta}$ is a coefficient vector, $\mathbf{x_i}$ is a vector of covariates of individual i, and ϵ_i is an error term. Covariates x_i include a set of dummy variables indicating age groups (30s/40s and 50/60s); a dummy for female; a dummy for living with elderly; a dummy for living with infant; a dummy for high education (college or more); a dummy for high income (6 million yen or more); a dummy for underlying diseases; a dummy for contract worker; a dummy for non-regular worker; a set of dummies for industry; a dummy for availability of at least partial remote work;[9] and a set of dummies for infection waves (from the first to seventh wave).

4.2 Results

Table 4 shows the regression results for the labor outcomes during the isolation period. The first two columns report the results associated with dummy variables for reductions in hours worked and income as response variables. The last column reports the results associated with the size of the income reduction as a response variable. Due to the space limitation, we only report coefficients of selected variables. Full results are shown in Appendix C. The results in the first two columns indicate how each covariate is linked to the likelihood of reducing hours and income in percentage points. The results in the last column indicate how each covariate is linked to the reduction in income in percentage points.

The likelihood of reducing hours and income is linked to several demographic/socio-economic characteristics. Those who are older than 50 are more likely to experience reductions in hours than those in their 20s, but are less likely to experience in reduction in income. Females and those who live with the elderly are more likely to experience a reduction in hours than males and those who do not live with the elderly. College and university graduates are more likely to experience a reduction in hours than those with lower education, but less likely to reduce income. Those who earned more than 6 million yen are less likely to reduce hours and income than the lower-income workers.

Those with pre-existing health conditions and contract/non-regular workers are more likely to reduce their income than those without them or permanent workers. Workers in accommodation, food, and beverage industries are more likely to reduce hours and income than those in agriculture. Workers who have remote-work availability are less

[9]Since our survey collected information on remote work availability only from employees, we only use samples of employees.

likely to reduce hours and income than those who cannot.

The relative size of conditional income reduction is also linked to several demographic/socio-economic characteristics. Females, low-income workers, and those with pre-existing health conditions experienced a larger relative reduction in income than the others. Contract and non-regular workers experienced a larger relative reduction than permanent workers. Those who did not have remote-work availability experienced a larger relative reduction than those who can. Those who were vaccinated twice at the time of infection experienced a smaller relative reduction than those who are less vaccinated.

	(1) **Reduction in hours**	(2) **Reduction in income**	(3) **Size of income reduction**
Age: 30s, 40s	0.0268	-0.0355*	-0.609
	(0.0171)	(0.0142)	(2.269)
Age: 50s, 60s	0.0720***	-0.0463**	-2.709
	(0.0188)	(0.0156)	(2.533)
Female	0.0690***	0.0142	5.476**
	(0.0126)	(0.00953)	(1.895)
Living with elderly	0.0405*	-0.0143	1.758
	(0.0160)	(0.0127)	(2.146)
Living with infant	0.0122	-0.00477	-3.575
	(0.0152)	(0.0114)	(2.279)
College or more	0.0514***	-0.0300**	1.901
	(0.0123)	(0.0101)	(1.672)
Income: $\geq$ 6 mil. yen	-0.0384**	-0.0351***	-8.989***
	(0.0137)	(0.00943)	(2.245)
Having disease	0.0260	0.0395**	8.110***
	(0.0177)	(0.0138)	(2.395)
Contract worker	-0.0193	0.0795***	8.346**
	(0.0184)	(0.0153)	(2.709)
Non-regular worker	0.0519**	0.312***	21.29***
	(0.0162)	(0.0148)	(2.048)
Accomodation,	0.274*	0.265**	-10.68
food&beverage industry	(0.106)	(0.0906)	(7.729)
Remote work available	-0.0669***	-0.112***	-12.44***
	(0.0133)	(0.0105)	(2.053)
Vaccine: $\geq$ 2 dozes	0.00552	-0.0171	-3.953*
	(0.0143)	(0.0116)	(1.921)
N	8432	8432	1949

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Regression results with labor outcomes during isolation

We now turn to the regression results after the isolation period. According to Table 5, workers with a college degree or more and those who have pre-existing health conditions are less likely to experience reductions in income than workers with workers without a college degree and healthy workers, respectively. Contract and non-regular workers are more likely to experience reductions in hours and income than permanent workers. Workers in accommodation, food, and beverage industries are more likely to reduce hours than those in the agricultural sector. Workers with remote-work availability were less likely to experience reductions in hours and income than those without it. Finally, those who had been vaccinated at least twice prior to the time of infection are less likely to experience reductions in hours than those who had been vaccinated less than twice.

	(1)	(2)	(3)	(4)	(5)
	Reduction in hours	**Reduction in income**	**Size of income reduction**	**Duration of hours reduction**	**Duration of income reduction**
Age: 30s, 40s	-0.0108	-0.0115	0.0512	0.415**	1.013***
	(0.0130)	(0.0113)	(0.264)	(0.154)	(0.287)
Age: 50s, 60s	-0.00225	-0.0108	0.118	0.659**	1.461***
	(0.0144)	(0.0125)	(0.288)	(0.209)	(0.351)
Female	0.0127	0.00103	0.0699	0.0946	-0.506
	(0.00893)	(0.00757)	(0.207)	(0.162)	(0.299)
Living with elderly	-0.00239	-0.0194	-0.344	0.0871	-0.440
	(0.0121)	(0.0109)	(0.234)	(0.196)	(0.385)
Living with infant	-0.0110	-0.0147	0.151	0.451**	0.667*
	(0.0110)	(0.00935)	(0.242)	(0.154)	(0.330)
College or more	-0.0146	-0.0359***	-0.252	-0.0150	0.210
	(0.00934)	(0.00822)	(0.183)	(0.179)	(0.288)
Income: $\geq$ 6 mil. yen	-0.00839	-0.00903	-0.160	-0.0757	-0.159
	(0.00945)	(0.00774)	(0.230)	(0.196)	(0.442)
Having disease	0.0508***	0.0237*	0.704**	0.558	-0.0975
	(0.0141)	(0.0119)	(0.270)	(0.319)	(0.340)
Contract worker	0.0377**	0.0311**	0.261	-0.00878	-0.0365
	(0.0142)	(0.0118)	(0.280)	(0.219)	(0.451)
Non-regular worker	0.116***	0.116***	1.041***	-0.0143	-0.389
	(0.0133)	(0.0123)	(0.224)	(0.190)	(0.307)
Accomodation, food&beverage industry	0.198*	0.0906	-0.141	-0.774	-3.714***
	(0.0873)	(0.0796)	(0.508)	(1.263)	(0.654)
Remote work available	-0.0322***	-0.0513***	-0.314	-0.00660	0.445
	(0.00974)	(0.00828)	(0.220)	(0.204)	(0.375)
Vaccine: $\geq$ 2 dozes	-0.0257*	-0.0173	-0.412	-0.421	-1.067**
	(0.0110)	(0.00979)	(0.217)	(0.250)	(0.379)
N	8432	8432	964	1372	964

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Regression results with labor outcomes after isolation

Workers in their 30s or older and those who live with infants experienced a longer duration of the reduction in hours and income. Workers with pre-existing health conditions experienced a larger reduction in income than workers without them. Non-regular workers experienced a larger relative reduction in income than permanent workers, whereas workers in accommodation, food, and beverage industries experienced a shorter duration of income reduction. Those who had been vaccinated at least twice prior to the time of infection experienced a shorter duration of income reduction than those who had been vaccinated less than twice.

Vaccines mitigate negative labor impacts after the isolation period, though they do not do so during the isolation period. We conduct mediation analysis to investigate how vaccines affect labor outcomes. In particular, we add the duration of symptoms workers experienced to the regression equation and estimate it. With this specification, the coefficients on vaccines can be interpreted as the impact of vaccines other than the effect through mitigating the symptom. This estimation result shows that the vaccine mitigates labor outcomes mainly via shortening the duration of symptoms. We describe the details of this mediation analysis in Appendix A.

We also investigate whether the relationships between individual characteristics and labor outcomes vary across those with and without long-lasting symptoms.[10] Specifically, we conduct the regression analyses for each of two subgroups defined by the duration of symptoms: those with symptoms lasting for longer/shorter than a month.[11] Tables 11 to 14 in Appendix D show the coefficients from regression of the effects on the labor outcomes during and after the isolation period for the those with symptoms lasting for longer/shorter than a month. According to these tables, remote-work availability, employment type, and vaccines matter less for those with symptoms lasting for longer than a month than for the others, though the low confidence level suggests the possibility of non-robustness.

5 Macro Estimates

5.1 Method

We combine information from our survey with various assumptions from available official statistics to estimate the aggregate reduction in hours worked in Japan associated with COVID-19 infection. We estimate the aggregate reduction for each year of 2020,

[10]We do not include the variables for symptoms to avoid bad control: Symptom's presence, duration, and seriousness are affected by the sex and age, which we have as exogenous variables.

[11]As reported in Table 3, the number of asymptomatic samples is small. Therefore, we do not compare the symptomatic and the asymptomatic.

2021, and 2022. We proceed in three steps.

First, we estimate average reduction in hours for each year of infection and industry. We begin by splitting the entire sample into sub-samples based on the year of infection and industry. For each sub-sample, we compute average reduction in hours for both during and after isolation. To obtain the average reduction in hours, we multiply each participant's (i) hours worked before the pandemic—a proxy for the hours worked before infection—, (ii) the size of reduction in hours—which we proxy by the size of income reduction during/after isolation conditional on reduction because our data does not have information on the size of hours reduction —and (iii) the duration of hospitalization/isolation/hours reduction after isolation.

Second, we estimate reduction in hours per infected worker for each year. We take average over industry of the average hours reduction for each year and industry, which we derived in the first step. We use national industry composition from National Census in 2020. By this procedure of taking industry-wise employment weighted average, we can match our samples to data in terms of the distribution of workers' industry, which is not matched in our survey design.

Finally, we obtain the aggregate hours reduction due to infection by multiplying the average reduction per infected worker obtained in the previous two steps with the number of infected workers. We compute the number of infected workers by multiplying (iv) the number of infections and (v) the labor force participation rate.

In our baseline estimate—shown in the middle column of Table 6, we calibrate (i) hours worked before the pandemic based on the median of the reported hours worked from Employment Status Survey in 2018, (ii) size of income reduction based on our survey, and (iii) the duration of isolation/hours reduction after isolation based on our survey. We calibrate (iv) the number of infections based on the number of infections aged between 20 and 69 published by the Ministry of Health, Labour, and Welfare and (v) the labor participation rate based on that of age between 15 and 64 from the Labor Force Survey.

In addition to the baseline estimate, we estimate the reduction in aggregate hours under two alternative assumptions regarding the aforementioned five parameters in order to take into account various sources of uncertainties. The first and third columns of Table 6 summarize our calibration for low and high scenarios. We discuss the calibration details for these two alternative scenarios in Appendix B.

	Low estimate	Baseline	High estimate
(i) Hours worked before pandemic	Lower limit	Median	Higher limit
(ii) Size of hours reduction	during hospitalization Same as baseline during isolation Same as baseline after isolation 80% of baseline	during hospitalization 100% during isolation 1 - Remote-work availability after isolation Size of income reduction	during hospitalization Same as baseline during isolation 1 - 80% of Remote-work availability after isolation 120% of baseline
(iii) Duration of hours reduction	during hospitalization Baseline - 1 day during isolation Baseline - 3 days after isolation Baseline - 1 month	during hospitalization Reported duration during isolation Reported duration after isolation Reported duration	during hospitalization Baseline + 1 day during isolation Baseline + 3 days after isolation Baseline + 1 month
(iv) Number of cases	age 20–59	age 20–69	age 20–79
(v) Labor participation rate	Age 15–	Age 15–64	Same as baseline

Table 6: Assusmptions for aggregate labor supply impact estimations

5.2 Results

Figure 2 presents our estimates of the aggregate reduction in hours worked for 2020, 2021, and 2022. The left panel shows the average reduction in hours worked per infected worker; The middle panel shows the number of infected workers; The right panel shows the aggregate percentage reduction in hours worked from the level in 2019.

According to the left panel, the average reduction in hours worked declined over time. It declined from 180 hours in 2020 to 105 hours in 2021 to 60 hours in 2022. This decline likely reflects a decline in pathogenicity and shortened isolation periods.

Meanwhile, the number of infected workers increased over time, as shown in the middle panel: It increased from 136 thousand in 2020 to 792 thousand in 2021 to more than 12 million in 2022. This increase is consistent with the emergence of the omicron variant at the beginning of 2022 that was substantially more transmissive than previous variants. The average reduction in hours per infected worker and the number of infected workers yield the aggregate labor supply reduction.

According to the right panel, the aggregate labor supply reduction is 0.02 percent in 2020, 0.06 percent in 2021, and 0.55 percent in 2022 of pre-pandemic hours worked in Japan (25 million hours in 2020, 83 million hours in 2021, and 749 million hours in 2022). Even though the hours reduction per infected worker was smaller in 2022 than that in the precedent years, the aggregate labor supply reduction is the largest in 2022 because the number of infected workers increased explosively in 2022.

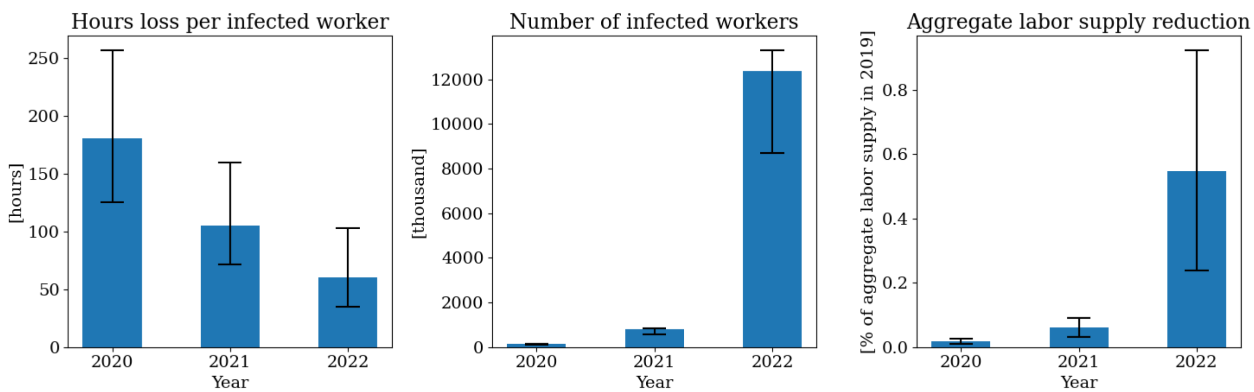

Figure 2: Estimated aggregate labor supply reduction from 2020 to 2022.

5.3 Comparison with estimates in U.S.

We compare the aggregate labor supply reduction in Japan with those in the U.S. There are several estimates of how much COVID symptoms affected aggregate labor supply in the U.S., such as Abraham and Rendell (2023), Bach (2022a), and Bach (2022b). Among these estimates in U.S., Bach (2022a) features the similar framework with ours. Thus, we focus on comparing our estimate with her estimate.[12]

To make an apples-to-apples comparison, we make a couple of an adjustment to the estimate of Bach (2022a). First, Bach (2022a) considers infected workers with symptoms lasting for longer than a month, whereas we consider infected workers with symptoms lasting for longer than a month. We augment the estimate of Bach (2022a) to include infected workers with symptoms lasting less than one month or no symptom, assuming that they experienced reductions in hours that are half of the reduction experienced by infected workers with symptoms lasting longer than one month, as in our estimate. Second, we will compare the aggregate labor supply impact across Japan and the U.S. for 2020 and 2021âthe first two years of COVID-19 pandemic. Because the period considered in Bach (2022a) is based on 22 months of data from January 2020 to October 2021, we

[12]The estimate of Bach (2022a) computed the aggregate labor supply impact of COVID-19 by identifying the labor outcomes of infected workers following COVID-19 infection based on various surveys on COVID patients. Abraham and Rendell (2023) and Goda and Soltas (2022) adopt an alternative approach. They compute the reduction in hours worked following COVID-19 infection using longitudinal public surveys, assuming that the excess health-related reduction in hours worked in the surveys is all attributable to COVID-19. They compute the excess health-related reduction in hours worked as a gap between the reported hours decline due to health problems and what would have been realized without the pandemic.

adjust her estimate obtained in the first step above by multiplying it by 24/22.

According to Table 7, the aggregate reduced hours worked in U.S. was more than more than 40 times larger than in Japan. 1 million workers got infected with COVID-19 and each infected worker lost 116 hours on average in Japan, whereas 124 million workers got infected with COVID-19 and infected workers lost 36 hours on average in the U.S. The number of infected workers in the U.S. was more than 100 times larger, whereas the reduced hours per infected worker in the U.S. was less than a third of those in Japan.

		Japan (our estimate)	US (Bach, 2022a)
(i)	Hours reduction per infected worker	116 hours	36 hours
(ii)	Number of infected workers	1 million	124 million
(iii)	Aggregate labor supply reduction	108 million hours	4,464 million hours

Table 7: Estimates of aggregate labor supply reduction from 2020 to 2021 due to COVID-19 infection

6 Caveats

There are several limitations in our study. First, our survey method may contain sample selection bias. Participants of this survey are paid with a reward, which is not assumed to be high. Therefore, they are biased toward those who lowly evaluate their cost of reporting. Another potential source of sample selection bias is that workers who were more severely affected by COVID-19 infection might have been more willing to participate in our survey than workers who were less severely affected. This bias may emerge because our survey provides a rare opportunity for infected workers to share their experiences with others and more severely affected workers may be more interested in sharing their untold tragedies with others than less severely affected workers.

Second, our survey data may contain reporting bias. Because our survey is a retrospective survey going back to the beginning of the crisis, participants had to answer their experiences from as long as 3 years ago. Memories from the distant past might not be accurate. That is, our survey may suffer from recall bias. Even if this bias is not applicable, some participants may have reported randomly without looking back on their actual experiences, as in any survey.

Third, the reported negative labor impacts in our data may contain the effect of lower labor demand, in addition to, or instead of, the labor supply reduction due to COVID-19 infection. For instance, think of a worker who reported 30 percent-decline in income during the isolation period. It might be the case that 20 percent was due to COVID-19 infection but 10 percent was the result of the decline in economic activity. This situation could easily happen for infected workers in restaurants and bars if they got infected just when the government issued state-of-emergency order and the restaurants and bars have to reduce their operating hours.

To see whether the reported negative impacts on labor outcomes reflect the demand channel, we examined whether the reported income decline is correlated with indicators of labor demand in the economy. In particular, we defined the period of low labor demand in three ways: (i) during state of emergency, (ii) periods when Indices of Tertiary Industry Activity (ITA) declined from the previous month, and (iii) periods when ITA for accommodations and restaurants (ITA-AR) declined from the previous month. As presented in Appendix E, the results show that these dummies for low labor demand did not affect the reported income decline. Thus, it is likely that the reported negative labor impacts in our survey are mostly due to COVID-19 infection.

7 Conclusion

We conducted a large-scale retrospective survey to investigate how COVID-19 infection affected the labor outcomes of infected workers.

Many infected workers—including those without any COVID-19 symptoms—experienced some reductions in hours worked or earnings immediately after infection. The negative labor impacts often lasted for more than a month. The negative labor impacts were particularly pronounced for contract workers, non-regular workers, workers without remote-work availability, and those unvaccinated.

Our estimate based on the survey and other official statistics indicates that COVID-19 infection had a non-negligible negative impact on the aggregate labor supply in 2022, though it had a very small impact in 2020 and 2021. We contrasted our 2020-2021 estimate with those from the U.S. and found that the aggregate labor supply reduction associated with COVID-19 infection was much smaller in Japan than in the U.S., reflecting a much smaller number of infected workers in Japan than in the U.S.

References

Abraham, K. and L. Rendell (2023). Where are the missing workers? In *Brookings Papers on Economic Activity Conference Draft March*.

Adams-Prassl, A., T. Boneva, M. Golin, and C. Rauh (2020). Inequality in the impact of the coronavirus shock: Evidence from real time surveys. *Journal of Public economics 189*, 104245.

Aiyegbusi, O. L., S. E. Hughes, G. Turner, S. C. Rivera, C. McMullan, J. S. Chandan, S. Haroon, G. Price, E. H. Davies, K. Nirantharakumar, et al. (2021). Symptoms, complications and management of long COVID: a review. *Journal of the Royal Society of Medicine 114*(9), 428–442.

Albanesi, S. and J. Kim (2021a). Effects of the COVID-19 recession on the US labor market: Occupation, family, and gender. *Journal of Economic Perspectives 35*(3), 3–24.

Albanesi, S. and J. Kim (2021b). The gendered impact of the COVID-19 recession on the US labor market. Technical report, National Bureau of Economic Research.

Alimohamadi, Y., M. Sepandi, M. Taghdir, and H. Hosamirudsari (2020). Determine the most common clinical symptoms in COVID-19 patients: a systematic review and meta-analysis. *Journal of preventive medicine and hygiene 61*(3), E304.

Alon, T., S. Coskun, M. Doepke, D. Koll, and M. Tertilt (2022). From mancession to shecession: Women's employment in regular and pandemic recessions. *NBER Macroeconomics Annual 36*(1), 83–151.

Alon, T., M. Doepke, J. Olmstead-Rumsey, and M. Tertilt (2020). This time it's different: the role of women's employment in a pandemic recession. Technical report, National Bureau of Economic Research.

Bach, K. (2022a). Is long Covid worsening the labor shortage? *report*.

Bach, K. (2022b). New data shows long Covid is keeping as many as 4 million people out of work. *report*.

Baek, C., P. B. McCrory, T. Messer, and P. Mui (2021). Unemployment effects of stay-at-home orders: Evidence from high-frequency claims data. *Review of Economics and Statistics 103*(5), 979–993.

Bartik, A. W., M. Bertrand, F. Lin, J. Rothstein, and M. Unrath (2020). Measuring the labor market at the onset of the COVID-19 crisis. Technical report, National Bureau of Economic Research.

Bluedorn, J., F. Caselli, N.-J. Hansen, I. Shibata, and M. M. Tavares (2023). Gender and employment in the COVID-19 recession: Cross-country evidence on "she-cessions". *Labour Economics 81*, 102308.

Cabrera Martimbianco, A. L., R. L. Pacheco, Â. M. Bagattini, and R. Riera (2021). Frequency, signs and symptoms, and criteria adopted for long COVID-19: A systematic review. *International journal of clinical practice 75*(10), e14357.

Çalıca Utku, A., G. Budak, O. Karabay, E. Güçlü, H. D. Okan, and A. Vatan (2020). Main symptoms in patients presenting in the COVID-19 period. *Scottish medical journal 65*(4), 127–132.

Campello, M., G. Kankanhalli, and P. Muthukrishnan (2020). Corporate hiring under COVID-19: Labor market concentration, downskilling, and income inequality. Technical report, National Bureau of economic research.

Chetty, R., J. N. Friedman, and M. Stepner (2024). The economic impacts of COVID-19: Evidence from a new public database built using private sector data. *The Quarterly Journal of Economics 139*(2), 829–889.

Chiba, A., S. Hori, and T. Nakata (2025). Quarantine and its scar on labor. Mimeo.

Chopra, V., S. A. Flanders, M. O'Malley, A. N. Malani, and H. C. Prescott (2021). Sixty-day outcomes among patients hospitalized with COVID-19. *Annals of internal medicine 174*(4), 576–578.

Coibion, O., Y. Gorodnichenko, and M. Weber (2020). Labor markets during the COVID-19 crisis: A preliminary view. Technical report, National Bureau of economic research.

Cortes, G. M. and E. Forsythe (2023). Heterogeneous labor market impacts of the COVID-19 pandemic. *ILR Review 76*(1), 30–55.

Deole, S. S., M. Deter, and Y. Huang (2023). Home sweet home: Working from home and employee performance during the COVID-19 pandemic in the UK. *Labour economics 80*, 102295.

Faberman, R. J., A. I. Mueller, and A. Şahin (2022). Has the willingness to work fallen during the Covid pandemic? *Labour Economics 79*, 102275.

Fischer, K., J. J. Reade, and W. B. Schmal (2022). What cannot be cured must be endured: The long-lasting effect of a COVID-19 infection on workplace productivity. *Labour Economics 79*, 102281.

Forsythe, E., L. B. Kahn, F. Lange, and D. Wiczer (2020). Labor demand in the time of COVID-19: Evidence from vacancy postings and ui claims. *Journal of public economics 189*, 104238.

Fukai, T., H. Ichimura, and K. Kawata (2021). Describing the impacts of COVID-19 on the labor market in Japan until june 2020. *The Japanese Economic Review 72*(3), 439–470.

Goda, G. S. and E. J. Soltas (2022). The impacts of COVID-19 illnesses on workers. Technical report.

Hansen, S., P. J. Lambert, N. Bloom, S. J. Davis, R. Sadun, and B. Taska (2023). Remote work across jobs, companies, and space. Technical report, National Bureau of Economic Research.

Jacobs, L. G., E. Gourna Paleoudis, D. Lesky-Di Bari, T. Nyirenda, T. Friedman, A. Gupta, L. Rasouli, M. Zetkulic, B. Balani, C. Ogedegbe, et al. (2020). Persistence of symptoms and quality of life at 35 days after hospitalization for COVID-19 infection. *PloS one 15*(12), e0243882.

Kikuchi, S., S. Kitao, and M. Mikoshiba (2021). Who suffers from the COVID-19 shocks? labor market heterogeneity and welfare consequences in Japan. *Journal of the Japanese and International Economies 59*, 101117.

Kotera, S. and J. Schmittmann (2022). *The Japanese labor market during the COVID-19 pandemic*. International Monetary Fund.

Lee, D., J. Park, and Y. Shin (2023). Where are the workers? From great resignation to quiet quitting. Technical report, National Bureau of Economic Research.

McKinsey & Company (2023). One billion days lost: How COVID-19 is hurting the US workforce. *report*.

OECD. Real gross domestic product (GDP). Accessed: 2024-12-24.

Okubo, T. and Nippon Institute for Research Advancement (2024). 10th survey of labor conditions on work from home (in Japanese). *Research Reports*.

Shibata, I. (2021). The distributional impact of recessions: The global financial crisis and the COVID-19 pandemic recession. *Journal of Economics and Business 115*, 105971.

Soh, J., M. Oikonomou, C. Pizzinelli, I. Shibata, and M. M. Tavares (2024). Did the Covid-19 recession increase the demand for digital occupations in the USA? Evidence from employment and vacancies data. *IMF Economic Review*, 1–22.

Spiegel, M. and H. Tookes (2021). Business restrictions and COVID-19 fatalities. *The Review of Financial Studies 34*(11), 5266–5308.

Su, C.-W., K. Dai, S. Ullah, and Z. Andlib (2022). COVID-19 pandemic and unemployment dynamics in European economies. *Economic Research-Ekonomska Istraživanja 35*(1), 1752–1764.

U.S. Bureau of Economic Analysis. Real Gross Domestic Product, retrieved from FRED, Federal Reserve Bank of St. Louis. Accessed: 2024-12-24.

Appendix

A Mediation analyses

We have found that workers with vaccines were less likely to experience a reduction in hours worked, faced a smaller amount of income reduction, and experienced a shorter duration of income reduction. In this section, we conduct mediation analysis to further investigate how vaccine affects those labor outcomes. Specifically, we add the duration of any COVID-19 symptoms to the regression equation. With this specification, the coefficients on vaccines can be interpreted as the impact of vaccines other than the effect through mitigating the symptom.

This estimation result shown in Table 8 suggests that vaccines mitigate labor outcomes mainly via the reduction of duration of symptoms. The coefficients on vaccines are now insignificant for the size of income reduction. In turn, symptom duration has significant and robust effects on labor outcomes. These results mean that the relation between vaccine and labor outcomes is weak conditional on the duration of symptoms, suggesting that the effect of vaccine worked mainly via affecting the duration of symptoms.

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction	(4) Duration of hours reduction	(5) Duration of income reduction
Symptom duration(months)	0.0222***	0.0179***	0.171**	0.261**	0.413***
	(0.00402)	(0.00369)	(0.0622)	(0.0808)	(0.111)
Age: 30s, 40s	-0.0132	-0.0133	0.00805	0.359*	0.909**
	(0.0130)	(0.0113)	(0.264)	(0.156)	(0.283)
Age: 50s, 60s	-0.00292	-0.0114	0.0746	0.617**	1.356***
	(0.0144)	(0.0125)	(0.287)	(0.206)	(0.339)
Female	0.00867	-0.00225	0.00249	0.0263	-0.669*
	(0.00892)	(0.00758)	(0.204)	(0.161)	(0.289)
Living with elderly	-0.00393	-0.0206	-0.351	0.0414	-0.456
	(0.0121)	(0.0108)	(0.232)	(0.193)	(0.379)
Living with infant	-0.0140	-0.0170	0.120	0.422**	0.592
	(0.0109)	(0.00935)	(0.241)	(0.154)	(0.332)
College or more	-0.0139	-0.0353***	-0.243	0.0114	0.232
	(0.00933)	(0.00820)	(0.182)	(0.178)	(0.281)
Income: $\geq$ 6 mil. yen	-0.00703	-0.00794	-0.129	-0.0466	-0.0844
	(0.00943)	(0.00773)	(0.231)	(0.191)	(0.439)
Having disease	0.0437**	0.0180	0.559*	0.398	-0.449
	(0.0140)	(0.0117)	(0.272)	(0.333)	(0.354)
Contract worker	0.0372**	0.0306**	0.259	-0.00405	-0.0401
	(0.0142)	(0.0117)	(0.279)	(0.211)	(0.435)
Non-regular worker	0.114***	0.115***	1.038***	-0.0462	-0.397
	(0.0133)	(0.0123)	(0.223)	(0.191)	(0.303)
Accomodation, food&beverage industry	0.186*	0.0806	-0.116	-0.795	-3.655***
	(0.0867)	(0.0791)	(0.506)	(1.262)	(0.652)
Remote work available	-0.0326***	-0.0517***	-0.340	-0.0695	0.384
	(0.00971)	(0.00826)	(0.221)	(0.211)	(0.377)
Vaccine: $\geq$ 2 dozes	-0.0215	-0.0139	-0.362	-0.311	-0.947*
	(0.0110)	(0.00978)	(0.216)	(0.253)	(0.373)
N	8432	8432	964	1372	964

Standard errors in parenthesis.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 8: Regression results with labor outcomes after isolation with symptom duration

B Calibration for lower and higher macro-estimates

As discussed in the main text, each of the five parameters for our macro estimate contains various sources of uncertainty.

For hours worked before the pandemic, the Employment Status Survey (ESS)—which we used to calibrate this parameter—does not ask the exact number of hours worked but provides the respondents with multiple choices with each specifying a range. Thus, the true number of hours worked within the selected range is unknown.

For the percentage of reduction in hours during isolation—which we approximate by remote-work availability—our survey evidence based on Tokyo may not be applicable to average workers in Japan. Workers in Tokyo are more likely to have remote-work availability (Okubo and Nippon Institute for Research Advancement, 2024).

For the percentage of reduction in hours after isolation—which we approximate by the percentage reduction in income—, our approximation implicitly assumes that the labor productivity before and after getting infected was unchanged; if it had been changed, the reduction in hours might have been larger or smaller than the income reduction.

For the duration of hours reduction, our survey provides the respondents with multiple choices with each specifying a range. Thus, the actual duration of reduction in hours after isolation is unknown.

For the number of cases and the labor force participation rate, we also considered ranges. Our goal is to compute the aggregate labor supply reduction, that is, hours reduced by workers of all ages. However, our survey targets the workers aged between 20 and 64. It is unknown whether workers aged 65 and older may have lost a larger or smaller amount of hours than the younger workers. For simplicity, instead of adjusting the hours reduction per infected worker, we assumed a range for both the number of cases and the labor force participation rate.

To address these sources of uncertainties about key parameters, we also consider two alternative estimates: high and low.

For pre-pandemic labor hours, we used the lower and the higher bounds of the reported range, respectively. For the size of the reduction in hours worked, we hold the same assumption as in the baseline scenario during hospitalization. Hours reduction during isolation is set larger in the high estimate by assuming remote-work availability mitigates hours reduction by 80 percent of the baseline scenario. Hours reduction after isolation is set larger and smaller than income reduction by 20 percent, respectively. For the duration of reduction, we added and subtracted one day, three days, and one month to the duration of hospitalization, isolation, and continued hours reduction after isolation, respectively. (iv) The number of cases targets those aged from 20 to 79 and from 20 to 59, respectively. (v) LPR targets the same age in the high estimate whereas targets older than 15 in the low estimate.

C Labor impacts with full results

	(1) **Reduction in hours**	(2) **Reduction in income**	(3) **Size of income reduction**
Age: 30s, 40s	0.0268	-0.0355*	-0.609
	(0.0171)	(0.0142)	(2.269)
Age: 50s, 60s	0.0720***	-0.0463**	-2.709
	(0.0188)	(0.0156)	(2.533)
Female	0.0690***	0.0142	5.476**
	(0.0126)	(0.00953)	(1.895)
Living with elderly	0.0405*	-0.0143	1.758
	(0.0160)	(0.0127)	(2.146)
Living with infant	0.0122	-0.00477	-3.575
	(0.0152)	(0.0114)	(2.279)
College or more	0.0514***	-0.0300**	1.901
	(0.0123)	(0.0101)	(1.672)
Income: $\geq$ 6 mil. yen	-0.0384**	-0.0351***	-8.989***
	(0.0137)	(0.00943)	(2.245)
Having disease	0.0260	0.0395**	8.110***
	(0.0177)	(0.0138)	(2.395)
Contract worker	-0.0193	0.0795***	8.346**
	(0.0184)	(0.0153)	(2.709)
Non-regular worker	0.0519**	0.312***	21.29***
	(0.0162)	(0.0148)	(2.048)
Forestry & food&Fishery	0.0126	0.205	-18.93
	(0.179)	(0.185)	(10.67)
Mining & Quarrying	0.0742	0.107	19.30*
	(0.164)	(0.0992)	(7.911)
Construction	0.213*	0.163	-6.716
	(0.105)	(0.0886)	(8.275)
Manufacturing	0.181	0.107	-11.56
	(0.104)	(0.0872)	(7.987)
Wholesale & Retail Trade	0.140	0.154	-13.37
	(0.104)	(0.0878)	(7.593)
Accomodation, food&beverage industry	0.274*	0.265**	-10.68
	(0.106)	(0.0906)	(7.729)
Finance & Insurance	0.222*	0.116	-13.38
	(0.104)	(0.0878)	(8.075)
Real estate	0.169	0.163	-9.260
	(0.106)	(0.0892)	(8.349)
Transport & Postal Services	0.173	0.253**	-11.35
	(0.106)	(0.0900)	(7.437)
Information Services	0.146	0.122	-8.423
	(0.104)	(0.0875)	(8.437)
Information & Communications	0.164	0.139	-10.06
	(0.104)	(0.0876)	(8.488)

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction
Electricity, Gas, Heat supply and Water	0.221	0.160	-6.252
	(0.113)	(0.0942)	(10.50)
Medical, Healthcare & Welfare	0.212*	0.203*	-10.72
	(0.104)	(0.0883)	(7.457)
Education & Learning Support	0.250*	0.121	-9.504
	(0.106)	(0.0888)	(8.118)
Services N.E.C.	0.166	0.170	-7.283
	(0.103)	(0.0875)	(7.493)
Government	0.200	0.0832	-8.873
	(0.105)	(0.0880)	(8.598)
Others	0.190	0.162	-6.984
	(0.106)	(0.0894)	(8.199)
Remote work available	-0.0669***	-0.112***	-12.44***
	(0.0133)	(0.0105)	(2.053)
Second wave	0.0558	0.0324	3.423
	(0.0586)	(0.0479)	(8.058)
Third wave	-0.0303	0.0269	3.011
	(0.0559)	(0.0446)	(8.334)
Fourth wave	0.0100	0.0465	0.367
	(0.0611)	(0.0499)	(8.087)
Fifth wave	0.0470	0.0405	0.115
	(0.0502)	(0.0401)	(7.219)
Sixth wave	0.00892	-0.0371	1.843
	(0.0455)	(0.0359)	(6.984)
Seventh wave	0.0243	-0.0276	1.428
	(0.0457)	(0.0360)	(6.997)
Eighth wave	0.0646	-0.0207	6.399
	(0.0461)	(0.0364)	(7.061)
Vaccine: $\geq$ 2 dozes	0.00552	-0.0171	-3.953*
	(0.0143)	(0.0116)	(1.921)
N	8432	8432	1949

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Regression results with full results during isolation

	(1) **Reduction in hours**	(2) **Reduction in income**	(3) **Size of income reduction**	(4) **Duration of hours reduction**	(5) **Duration of income reduction**
Age: 30s, 40s	-0.0108	-0.0115	0.0512	0.415**	1.013***
	(0.0130)	(0.0113)	(0.264)	(0.154)	(0.287)
Age: 50s, 60s	-0.00225	-0.0108	0.118	0.659**	1.461***
	(0.0144)	(0.0125)	(0.288)	(0.209)	(0.351)
Female	0.0127	0.00103	0.0699	0.0946	-0.506
	(0.00893)	(0.00757)	(0.207)	(0.162)	(0.299)
Living with elderly	-0.00239	-0.0194	-0.344	0.0871	-0.440
	(0.0121)	(0.0109)	(0.234)	(0.196)	(0.385)
Living with infant	-0.0110	-0.0147	0.151	0.451**	0.667*
	(0.0110)	(0.00935)	(0.242)	(0.154)	(0.330)
College or more	-0.0146	-0.0359***	-0.252	-0.0150	0.210
	(0.00934)	(0.00822)	(0.183)	(0.179)	(0.288)
Income: $\geq$ 6 mil. yen	-0.00839	-0.00903	-0.160	-0.0757	-0.159
	(0.00945)	(0.00774)	(0.230)	(0.196)	(0.442)
Having disease	0.0508***	0.0237*	0.704**	0.558	-0.0975
	(0.0141)	(0.0119)	(0.270)	(0.319)	(0.340)
Contract worker	0.0377**	0.0311**	0.261	-0.00878	-0.0365
	(0.0142)	(0.0118)	(0.280)	(0.219)	(0.451)
Non-regular worker	0.116***	0.116***	1.041***	-0.0143	-0.389
	(0.0133)	(0.0123)	(0.224)	(0.190)	(0.307)
Forestry & food&Fishery	0.0725	-0.0440		-1.733	
	(0.143)	(0.0786)		(1.181)	
Mining & Quarrying	0.258	0.166	-1.737***	-1.716	-3.886*
	(0.153)	(0.134)	(0.425)	(1.082)	(1.678)
Construction	0.123	0.0623	-0.635	-1.184	-3.194***
	(0.0848)	(0.0768)	(0.558)	(1.102)	(0.933)
Manufacturing	0.0869	0.0324	-0.952*	-1.655	-2.885**
	(0.0836)	(0.0759)	(0.465)	(1.058)	(0.974)
Wholesale & Retail Trade	0.122	0.0545	-0.658	-1.641	-4.011***
	(0.0841)	(0.0764)	(0.433)	(1.070)	(0.542)
Accomodation, food&beverage industry	0.198*	0.0906	-0.141	-0.774	-3.714***
	(0.0873)	(0.0796)	(0.508)	(1.263)	(0.654)
Finance & Insurance	0.123	0.0495	-0.641	-1.437	-2.466**
	(0.0842)	(0.0763)	(0.515)	(1.073)	(0.909)
Real estate	0.117	0.0835	0.166	-0.769	-1.612
	(0.0854)	(0.0776)	(0.664)	(1.211)	(1.059)
Transport & Postal Services	0.129	0.111	-0.297	-0.845	-2.412**
	(0.0856)	(0.0780)	(0.475)	(1.094)	(0.920)
Information Services	0.0996	0.0509	0.0447	-1.513	-3.272**
	(0.0841)	(0.0762)	(0.588)	(1.093)	(1.063)
Information & Communications	0.109	0.0456	0.504	-1.216	-3.634***
	(0.0841)	(0.0761)	(0.671)	(1.086)	(0.969)
Electricity, Gas, Heat supply and Water	0.0780	0.0850	-0.412	-2.026	-4.722***
	(0.0880)	(0.0817)	(0.638)	(1.083)	(0.776)
Medical, Healthcare & Welfare	0.116	0.0797	-0.146	-1.741	-3.743***
	(0.0843)	(0.0766)	(0.442)	(1.062)	(0.599)

	(1) **Reduction in hours**	(2) **Reduction in income**	(3) **Size of income reduction**	(4) **Duration of hours reduction**	(5) **Duration of income reduction**
Education & Learning Support	0.0901	0.0210	-0.498	-1.651	-3.332***
	(0.0851)	(0.0769)	(0.593)	(1.081)	(0.784)
Services N.E.C.	0.123	0.0747	0.0479	-1.352	-4.049***
	(0.0837)	(0.0762)	(0.434)	(1.034)	(0.586)
Government	0.0767	0.0288	-0.126	-0.611	-3.078**
	(0.0844)	(0.0765)	(0.565)	(1.244)	(1.077)
Others	0.0751	0.0673	-0.0229	-0.928	-3.754***
	(0.0850)	(0.0776)	(0.592)	(1.133)	(0.691)
Remote work available	-0.0322***	-0.0513***	-0.314	-0.00660	0.445
	(0.00974)	(0.00828)	(0.220)	(0.204)	(0.375)
Second wave	0.0138	-0.0717	-0.563	-0.627	0.316
	(0.0499)	(0.0433)	(0.910)	(1.193)	(1.708)
Third wave	-0.0664	-0.0365	-1.851*	-0.211	-0.452
	(0.0453)	(0.0431)	(0.817)	(1.547)	(1.793)
Fourth wave	-0.0504	-0.0717	-2.350**	-0.868	0.291
	(0.0497)	(0.0443)	(0.725)	(1.167)	(2.056)
Fifth wave	-0.0194	-0.0282	-1.482	-1.148	-0.588
	(0.0426)	(0.0394)	(0.760)	(1.064)	(1.479)
Sixth wave	-0.0765*	-0.0791*	-1.548*	-1.695	-1.985
	(0.0386)	(0.0361)	(0.706)	(0.991)	(1.320)
Seventh wave	-0.0549	-0.0817*	-1.906**	-2.212*	-3.147*
	(0.0388)	(0.0362)	(0.705)	(0.987)	(1.300)
Eighth wave	-0.0439	-0.0825*	-1.982**	-2.483*	-3.141*
	(0.0392)	(0.0364)	(0.719)	(0.976)	(1.324)
Vaccine: $\geq$ 2 dozes	-0.0257*	-0.0173	-0.412	-0.421	-1.067**
	(0.0110)	(0.00979)	(0.217)	(0.250)	(0.379)
N	8432	8432	964	1372	964

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Regression results with full results after isolation

D Labor impacts by symptom duration

D.1 During isolation

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction
Age: 30s, 40s	0.0334	-0.0180	2.649
	(0.0437)	(0.0386)	(5.416)
Age: 50s, 60s	0.0552	-0.0460	4.398
	(0.0482)	(0.0420)	(6.112)
Female	0.0640*	0.0243	5.960
	(0.0307)	(0.0253)	(4.306)
Living with elderly	0.00829	-0.00886	5.149
	(0.0405)	(0.0338)	(5.087)
Living with infant	0.0605	-0.0730*	-1.731
	(0.0416)	(0.0351)	(5.302)
College or more	0.0339	-0.0492	1.278
	(0.0314)	(0.0272)	(3.939)
Income: $\geq$ 6 mil. yen	-0.0502	-0.0232	-10.42
	(0.0362)	(0.0272)	(5.580)
Having disease	0.0153	0.0245	6.132
	(0.0392)	(0.0341)	(4.692)
Contract worker	-0.00716	0.177***	10.61
	(0.0476)	(0.0421)	(5.809)
Non-regular worker	0.0772*	0.307***	24.94***
	(0.0382)	(0.0351)	(4.731)
Accomodation,	0.562***	0.218**	-0.818
food&beverage industry	(0.0961)	(0.0794)	(13.50)
Remote work available	-0.0645	-0.134***	-6.937
	(0.0346)	(0.0295)	(4.646)
Vaccine: $\geq$ 2 dozes	-0.0444	-0.0269	-6.574
	(0.0349)	(0.0311)	(4.180)
N	1341	1341	401

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Regression results for those with symptoms lasting for longer than a month

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction
Age: 30s, 40s	0.0232	-0.0404**	-1.897
	(0.0187)	(0.0153)	(2.525)
Age: 50s, 60s	0.0737***	-0.0467**	-4.556
	(0.0205)	(0.0168)	(2.834)
Female	0.0661***	0.00676	4.830*
	(0.0139)	(0.0103)	(2.156)
Living with elderly	0.0459**	-0.0160	0.710
	(0.0174)	(0.0137)	(2.406)
Living with infant	0.00280	0.00146	-4.440
	(0.0164)	(0.0120)	(2.536)
College or more	0.0545***	-0.0257*	1.756
	(0.0134)	(0.0109)	(1.873)
Income: $\geq$ 6 mil. yen	-0.0356*	-0.0360***	-8.460***
	(0.0148)	(0.0101)	(2.518)
Having disease	0.0278	0.0382*	8.068**
	(0.0199)	(0.0151)	(2.780)
Contract worker	-0.0212	0.0606***	7.920*
	(0.0200)	(0.0161)	(3.097)
Non-regular worker	0.0448*	0.314***	20.71***
	(0.0180)	(0.0163)	(2.299)
Accomodation, food&beverage industry	0.274*	0.254**	-9.284
	(0.108)	(0.0913)	(8.171)
Remote work available	-0.0674***	-0.109***	-13.79***
	(0.0145)	(0.0112)	(2.317)
Vaccine: $\geq$ 2 dozes	0.0199	-0.0101	-3.209
	(0.0158)	(0.0124)	(2.195)
N	7091	7091	1548

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12: Regression results for those with symptoms lasting for shorter than a month

D.2 After isolation

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction	(4) Duration of hours reduction	(5) Duration of income reduction
Age: 30s, 40s	0.0623	0.0359	1.110	0.652	1.790
	(0.0341)	(0.0299)	(0.586)	(0.458)	(1.156)
Age: 50s, 60s	0.0689	0.0530	0.789	1.011	2.245*
	(0.0382)	(0.0334)	(0.648)	(0.528)	(1.048)
Female	0.0260	0.0126	0.194	0.106	-0.712
	(0.0248)	(0.0210)	(0.449)	(0.437)	(0.879)
Living with elderly	0.00821	-0.0355	-0.200	-0.339	-1.040
	(0.0343)	(0.0313)	(0.538)	(0.593)	(0.923)
Living with infant	-0.0132	-0.0135	0.0902	0.837	-0.0631
	(0.0353)	(0.0288)	(0.546)	(0.529)	(1.014)
College or more	-0.0124	-0.0508*	0.412	-0.0203	0.446
	(0.0254)	(0.0224)	(0.449)	(0.464)	(0.828)
Income: $\geq$ 6 mil. yen	-0.0383	-0.00438	-1.154*	-0.0425	-0.720
	(0.0290)	(0.0231)	(0.569)	(0.585)	(1.089)
Having disease	0.107**	0.0837*	1.046*	0.908	0.0623
	(0.0358)	(0.0325)	(0.514)	(0.820)	(0.796)
Contract worker	0.0300	0.0164	0.488	1.013	1.010
	(0.0401)	(0.0319)	(0.675)	(0.865)	(1.254)
Non-regular worker	0.107**	0.102***	0.638	-1.273**	-1.762*
	(0.0328)	(0.0301)	(0.550)	(0.464)	(0.832)
Accomodation, food&beverage industry	0.266**	0.00682	0.784	2.215	0.671
	(0.0846)	(0.0710)	(1.273)	(2.521)	(2.983)
Remote work available	0.0297	-0.0460	-1.212*	-0.987	-0.757
	(0.0273)	(0.0239)	(0.489)	(0.601)	(0.926)
Vaccine: $\geq$ 2 dozes	-0.0805**	-0.0417	-0.618	-0.365	-1.418
	(0.0290)	(0.0274)	(0.484)	(0.773)	(0.821)
N	1341	1341	207	298	207

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: Regression results for those with symptoms lasting for longer than a month

	(1) **Reduction in hours**	(2) **Reduction in income**	(3) **Size of income reduction**	(4) **Duration of hours reduction**	(5) **Duration of income reduction**
Age: 30s, 40s	-0.0277*	-0.0225	-0.170	0.285	0.947**
	(0.0140)	(0.0123)	(0.295)	(0.164)	(0.287)
Age: 50s, 60s	-0.0160	-0.0229	-0.0471	0.478*	1.233***
	(0.0155)	(0.0135)	(0.316)	(0.210)	(0.348)
Female	0.00544	-0.00449	-0.0219	0.0178	-0.548
	(0.00954)	(0.00815)	(0.232)	(0.161)	(0.294)
Living with elderly	-0.00557	-0.0175	-0.309	0.155	-0.216
	(0.0129)	(0.0115)	(0.267)	(0.194)	(0.383)
Living with infant	-0.0144	-0.0170	0.0566	0.376*	0.739*
	(0.0115)	(0.00988)	(0.271)	(0.158)	(0.352)
College or more	-0.0156	-0.0325***	-0.385	-0.0340	0.264
	(0.0100)	(0.00879)	(0.206)	(0.197)	(0.304)
Income: $\geq$ 6 mil. yen	-0.00173	-0.00876	0.0529	-0.0749	0.0296
	(0.00987)	(0.00819)	(0.252)	(0.180)	(0.459)
Having disease	0.0315*	0.00434	0.453	0.331	-0.336
	(0.0151)	(0.0122)	(0.340)	(0.342)	(0.319)
Contract worker	0.0388*	0.0331**	0.279	-0.250	-0.143
	(0.0151)	(0.0127)	(0.301)	(0.187)	(0.444)
Non-regular worker	0.117***	0.118***	1.143***	0.218	-0.104
	(0.0145)	(0.0136)	(0.250)	(0.211)	(0.333)
Accomodation, food&beverage industry	0.172*	0.0797	-0.103	-1.098	-3.808***
	(0.0855)	(0.0787)	(0.572)	(1.411)	(0.694)
Remote work available	-0.0422***	-0.0517***	-0.143	0.210	0.772
	(0.0103)	(0.00874)	(0.256)	(0.228)	(0.410)
Vaccine: $\geq$ 2 dozes	-0.00949	-0.00923	-0.229	-0.352	-0.861*
	(0.0118)	(0.0104)	(0.250)	(0.251)	(0.430)
N	7091	7091	757	1074	757

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 14: Regression results for those with symptoms lasting for shorter than a month

E Labor impacts considering the timing of infection

E.1 During isolation

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction
Age: 30s, 40s	0.0268	-0.0355*	-0.642
	(0.0171)	(0.0142)	(2.271)
Age: 50s, 60s	0.0718***	-0.0464**	-2.775
	(0.0188)	(0.0156)	(2.534)
Female	0.0691***	0.0143	5.466**
	(0.0126)	(0.00953)	(1.896)
Living with elderly	0.0405*	-0.0143	1.741
	(0.0160)	(0.0127)	(2.143)
Living with infant	0.0124	-0.00459	-3.482
	(0.0152)	(0.0114)	(2.284)
College or more	0.0514***	-0.0300**	1.869
	(0.0123)	(0.0101)	(1.672)
Income: $\geq$ 6 mil. yen	-0.0383**	-0.0351***	-8.997***
	(0.0137)	(0.00943)	(2.245)
Having disease	0.0260	0.0395**	8.077***
	(0.0177)	(0.0138)	(2.394)
Contract worker	-0.0193	0.0795***	8.372**
	(0.0184)	(0.0153)	(2.714)
Non-regular worker	0.0518**	0.312***	21.25***
	(0.0162)	(0.0148)	(2.048)
Accomodation, food&beverage industry	0.275**	0.266**	-9.196
	(0.106)	(0.0902)	(7.923)
Remote work available	-0.0668***	-0.112***	-12.41***
	(0.0133)	(0.0105)	(2.053)
Vaccine: $\geq$ 2 dozes	0.00605	-0.0167	-3.776
	(0.0143)	(0.0116)	(1.932)
State of Emergency	0.00928	0.00713	2.299
	(0.0176)	(0.0136)	(2.463)
N	8432	8432	1949

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15: Regression results during isolation considering whether the timing of infection was during the state of emergency or not.

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction
Age: 30s, 40s	0.0266	-0.0356*	-0.610
	(0.0172)	(0.0142)	(2.270)
Age: 50s, 60s	0.0709***	-0.0468**	-2.712
	(0.0188)	(0.0156)	(2.534)
Female	0.0685***	0.0140	5.475**
	(0.0125)	(0.00953)	(1.896)
Living with elderly	0.0405*	-0.0143	1.759
	(0.0160)	(0.0127)	(2.146)
Living with infant	0.0117	-0.00500	-3.576
	(0.0152)	(0.0114)	(2.280)
College or more	0.0512***	-0.0301**	1.900
	(0.0123)	(0.0101)	(1.673)
Income: $\geq$ 6 mil. yen	-0.0383**	-0.0351***	-8.992***
	(0.0137)	(0.00943)	(2.245)
Having disease	0.0268	0.0398**	8.110***
	(0.0177)	(0.0138)	(2.396)
Contract worker	-0.0191	0.0796***	8.346**
	(0.0184)	(0.0153)	(2.710)
Non-regular worker	0.0520**	0.312***	21.28***
	(0.0162)	(0.0148)	(2.054)
Accomodation, food&beverage industry	0.278**	0.267**	-10.64
	(0.106)	(0.0902)	(7.793)
Remote work available	-0.0664***	-0.112***	-12.44***
	(0.0133)	(0.0105)	(2.054)
Vaccine: $\geq$ 2 dozes	0.00600	-0.0169	-3.950*
	(0.0142)	(0.0116)	(1.921)
ITA low	0.0348*	0.0148	0.105
	(0.0164)	(0.0127)	(2.243)
N	8432	8432	1949

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 16: Regression results during isolation considering whether the timing of infection was on the month when ITA turned lower than the previous month or not.

	(1) **Reduction in hours**	(2) **Reduction in income**	(3) **Size of income reduction**
Age: 30s, 40s	0.0268	-0.0355*	-0.644
	(0.0171)	(0.0142)	(2.271)
Age: 50s, 60s	0.0714***	-0.0469**	-2.714
	(0.0188)	(0.0156)	(2.533)
Female	0.0689***	0.0141	5.469**
	(0.0125)	(0.00953)	(1.895)
Living with elderly	0.0407*	-0.0141	1.738
	(0.0160)	(0.0127)	(2.147)
Living with infant	0.0116	-0.00540	-3.558
	(0.0152)	(0.0114)	(2.281)
College or more	0.0513***	-0.0301**	1.909
	(0.0123)	(0.0101)	(1.673)
Income: $\geq$ 6 mil. yen	-0.0379**	-0.0346***	-8.961***
	(0.0137)	(0.00944)	(2.243)
Having disease	0.0266	0.0402**	8.112***
	(0.0177)	(0.0138)	(2.396)
Contract worker	-0.0190	0.0799***	8.356**
	(0.0184)	(0.0153)	(2.710)
Non-regular worker	0.0524**	0.312***	21.32***
	(0.0162)	(0.0148)	(2.049)
Accomodation, food&beverage industry	0.273*	0.265**	-10.48
	(0.108)	(0.0908)	(7.734)
Remote work available	-0.0664***	-0.112***	-12.45***
	(0.0133)	(0.0105)	(2.053)
Vaccine: $\geq$ 2 dozes	0.00636	-0.0162	-3.988*
	(0.0143)	(0.0115)	(1.924)
ITA-AR low	0.0229	0.0234*	-0.735
	(0.0130)	(0.00996)	(1.864)
N	8432	8432	1949

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 17: Regression results during isolation considering whether the timing of infection was on the month when ITA-AR turned lower than the previous month or not.

E.2 After isolation

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction	(4) Duration of hours reduction	(5) Duration of income reduction
Age: 30s, 40s	-0.0109	-0.0114	0.0507	0.398**	1.011***
	(0.0130)	(0.0113)	(0.265)	(0.154)	(0.286)
Age: 50s, 60s	-0.00247	-0.0108	0.108	0.642**	1.420***
	(0.0144)	(0.0125)	(0.288)	(0.209)	(0.343)
Female	0.0129	0.00100	0.0726	0.0890	-0.495
	(0.00893)	(0.00757)	(0.207)	(0.162)	(0.297)
Living with elderly	-0.00232	-0.0194	-0.353	0.0828	-0.474
	(0.0121)	(0.0109)	(0.233)	(0.197)	(0.387)
Living with infant	-0.0106	-0.0147	0.179	0.458**	0.778*
	(0.0110)	(0.00934)	(0.245)	(0.154)	(0.326)
College or more	-0.0145	-0.0359***	-0.249	-0.0245	0.220
	(0.00934)	(0.00822)	(0.183)	(0.177)	(0.284)
Income: $\geq$ 6 mil. yen	-0.00829	-0.00905	-0.157	-0.0684	-0.147
	(0.00946)	(0.00774)	(0.231)	(0.195)	(0.440)
Having disease	0.0507***	0.0237*	0.703**	0.557	-0.101
	(0.0141)	(0.0119)	(0.269)	(0.320)	(0.341)
Contract worker	0.0377**	0.0310**	0.257	-0.00500	-0.0494
	(0.0142)	(0.0118)	(0.281)	(0.219)	(0.450)
Non-regular worker	0.115***	0.116***	1.026***	-0.0152	-0.450
	(0.0133)	(0.0123)	(0.224)	(0.190)	(0.313)
Accomodation, food&beverage industry	0.200*	0.0901	-0.144	-0.560	-3.728***
	(0.0866)	(0.0796)	(0.508)	(1.297)	(0.652)
Remote work available	-0.0321**	-0.0514***	-0.315	-0.0105	0.445
	(0.00974)	(0.00828)	(0.219)	(0.204)	(0.371)
Vaccine: $\geq$ 2 dozes	-0.0248*	-0.0175	-0.393	-0.400	-0.991**
	(0.0110)	(0.00980)	(0.217)	(0.253)	(0.374)
State of Emergency	0.0155	-0.00321	0.298	0.393	1.201*
	(0.0127)	(0.0113)	(0.277)	(0.313)	(0.482)
N	8432	8432	964	1372	964

Standard errors in parenthesis.
$^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 18: Regression results after isolation considering whether the timing of infection was during the state of emergency or not.

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction	(4) Duration of hours reduction	(5) Duration of income reduction
Age: 30s, 40s	-0.0109	-0.0114	0.0475	0.430**	1.090***
	(0.0130)	(0.0113)	(0.264)	(0.153)	(0.295)
Age: 50s, 60s	-0.00247	-0.0104	0.112	0.686**	1.589***
	(0.0144)	(0.0125)	(0.290)	(0.211)	(0.354)
Female	0.0126	0.00123	0.0667	0.109	-0.441
	(0.00893)	(0.00757)	(0.208)	(0.163)	(0.292)
Living with elderly	-0.00239	-0.0193	-0.343	0.0696	-0.477
	(0.0121)	(0.0109)	(0.234)	(0.194)	(0.381)
Living with infant	-0.0112	-0.0145	0.151	0.461**	0.661*
	(0.0110)	(0.00935)	(0.242)	(0.155)	(0.333)
College or more	-0.0146	-0.0358***	-0.251	0.00771	0.190
	(0.00934)	(0.00822)	(0.183)	(0.177)	(0.288)
Income: $\geq$ 6 mil. yen	-0.00838	-0.00906	-0.160	-0.0685	-0.142
	(0.00946)	(0.00774)	(0.231)	(0.196)	(0.436)
Having disease	0.0509***	0.0234*	0.705**	0.538	-0.112
	(0.0141)	(0.0119)	(0.270)	(0.317)	(0.340)
Contract worker	0.0377**	0.0310**	0.260	-0.0128	-0.0174
	(0.0142)	(0.0118)	(0.280)	(0.221)	(0.454)
Non-regular worker	0.116***	0.116***	1.041***	0.0221	-0.379
	(0.0133)	(0.0123)	(0.224)	(0.192)	(0.304)
Accomodation,	0.199*	0.0888	-0.134	-1.065	-3.855***
food&beverage industry	(0.0871)	(0.0794)	(0.509)	(1.287)	(0.641)
Remote work available	-0.0321***	-0.0515***	-0.310	-0.0420	0.350
	(0.00973)	(0.00827)	(0.221)	(0.204)	(0.367)
Vaccine: $\geq$ 2 dozes	-0.0256*	-0.0175	-0.409	-0.445	-1.128**
	(0.0110)	(0.00979)	(0.216)	(0.250)	(0.377)
ITA low	0.00702	-0.0135	0.0697	-0.786*	-1.420**
	(0.0119)	(0.0106)	(0.261)	(0.320)	(0.450)
N	8432	8432	964	1372	964

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 19: Regression results after isolation considering whether the timing of infection was on the month when ITA turned lower than the previous month or not.

	(1) Reduction in hours	(2) Reduction in income	(3) Size of income reduction	(4) Duration of hours reduction	(5) Duration of income reduction
Age: 30s, 40s	-0.0108	-0.0115	0.0510	0.409**	1.013***
	(0.0130)	(0.0113)	(0.264)	(0.153)	(0.288)
Age: 50s, 60s	-0.00240	-0.0113	0.126	0.668**	1.486***
	(0.0144)	(0.0125)	(0.288)	(0.210)	(0.352)
Female	0.0127	0.000925	0.0665	0.0855	-0.517
	(0.00893)	(0.00757)	(0.207)	(0.162)	(0.299)
Living with elderly	-0.00232	-0.0191	-0.352	0.0665	-0.462
	(0.0121)	(0.0109)	(0.234)	(0.194)	(0.386)
Living with infant	-0.0112	-0.0152	0.153	0.441**	0.674*
	(0.0110)	(0.00936)	(0.242)	(0.154)	(0.334)
College or more	-0.0146	-0.0359***	-0.252	-0.00734	0.208
	(0.00934)	(0.00822)	(0.184)	(0.179)	(0.287)
Income: $\geq$ 6 mil. yen	-0.00827	-0.00866	-0.164	-0.0868	-0.175
	(0.00945)	(0.00774)	(0.231)	(0.197)	(0.443)
Having disease	0.0509***	0.0242*	0.716**	0.570	-0.0593
	(0.0142)	(0.0119)	(0.270)	(0.320)	(0.338)
Contract worker	0.0378**	0.0313**	0.265	-0.000704	-0.0218
	(0.0142)	(0.0117)	(0.280)	(0.220)	(0.452)
Non-regular worker	0.116***	0.116***	1.048***	0.00121	-0.369
	(0.0133)	(0.0123)	(0.224)	(0.192)	(0.305)
Accomodation,	0.198*	0.0904	0.00725	-0.651	-3.251***
food&beverage industry	(0.0875)	(0.0807)	(0.524)	(1.268)	(0.744)
Remote work available	-0.0321***	-0.0510***	-0.315	-0.0202	0.443
	(0.00974)	(0.00828)	(0.220)	(0.201)	(0.375)
Vaccine: $\geq$ 2 dozes	-0.0255*	-0.0166	-0.426*	-0.439	-1.111**
	(0.0110)	(0.00977)	(0.216)	(0.251)	(0.377)
ITA-AR low	0.00585	0.0186*	-0.204	-0.439	-0.640
	(0.00959)	(0.00799)	(0.212)	(0.258)	(0.374)
N	8432	8432	964	1372	964

Standard errors in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 20: Regression results after isolation considering whether the timing of infection was on the month when ITA-AR turned lower than the previous month or not.