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COVID-19 INFECTIONS, LABOUR MARKET SHOCKS, AND SUBJECTIVE WELL-BEING

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NON-TECHNICAL SUMMARY

The COVID-19 pandemic has had substantial adverse effects on the health and well-being of individuals worldwide. In this paper, we consider subjective-being as an individual outcome, with subjective well-being denoting an umbrella term for positive and negative affect, life satisfaction and domain satisfactions. The subjective well-being components considered in this paper are satisfaction with life overall, finances, family life, family health, own health, and health services. Based on a world-wide online survey of almost 5,700 respondents, this is the first paper to present new findings on how adverse labour market impacts and infections within the household, both directly due to COVID-19, are associated with reported subjective well-being in Australia, Germany, UK, US, Italy, and Spain. Directly due to COVID-19, experiencing either (i) reductions in salary and working hours, or (ii) becoming unemployed or having to file for unemployment benefits are associated with lower satisfaction with life in general, family life, family health, health services, and finances. The relationship is largest for financial satisfaction. Persons in households that have experienced a COVID-19 infection, either themselves or another household member, report lower levels of satisfaction with life, health, family life, and finances. Labour market shocks also appear to be much more important in explaining subjective well-being as compared to COVID-19 infections. This may in part reflect the fact that factors such as job loss are associated with long-term psychological scarring and financial shocks, and that persons who are the most ill are not captured in the survey. Continuous job creation programs will be essential as part of the recovery from the pandemic as, although temporary transfer payments are helpful in mitigating the adverse effects of the pandemic, sustainable employment will go a long way in improving people's subjective well-being.

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ABSTRACT

This is the first paper to present novel findings on how simultaneously (a) labour market shocks and (b) infections in the household, directly due to COVID-19, have impacted on life satisfaction and domain satisfactions. Using data from a world-wide online survey of almost 5,700 respondents across six countries, we estimate the associations of COVID-19-related labour market shocks and COVID-19 infection with life satisfaction and a range of domain satisfactions. Directly due to COVID-19, experiencing either (i) a reduction in salary and working hours, or (ii) unemployment or filing for unemployment benefits is significantly associated with lower reported satisfaction with family life, family health, available health services, and finances. The relationship is especially large for financial satisfaction. Reporting any COVID-19 labour market shock is also related to lower life satisfaction. Persons in households that have experienced a COVID-19 infection report significantly lower satisfaction with life, health, family life, and finances. Noteworthy is that labour market shocks are much more important in explaining subjective well-being compared to COVID-19 infections. The findings highlight the wide range of subjective well-being domains adversely affected by shocks to the labour market and health brought about by the COVID-19 pandemic.

Keywords: COVID-19; Coronavirus; Labour market shocks; Subjective well-being

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1. Introduction

Among many other effects, the COVID-19 pandemic has directly impacted on individuals' employment and health outcomes. One area in which these shocks may have affected individuals is in their subjective well-being. This is the first paper to consider the effect of (a) labour market shocks and (b) infections within the household, stemming directly from COVID-19 restrictions and its aftermath, on individual subjective well-being in six countries. Although the effect of unemployment on subjective well-being has received significant attention in the literature (e.g. Kassenboehmer and Haisken-DeNew, 2009; Powdthavee, 2012; Clark and Georgellis, 2013), the COVID-19 pandemic presents a unique opportunity to study the impact of major economy-wide exogenous health and labour market shocks on individual subjective well-being.

We use a unique data set that allows us to identify the presence of COVID-19 infections within the household, as well as specific labour market changes directly because of COVID-19, including job loss, applying for unemployment benefits, wage reductions, and reduced work hours. We investigate how COVID-19 infections and labour market shocks have affected overall life satisfaction and a range of domain satisfactions. To our knowledge this is one of the first papers to investigate how COVID-19 infections and COVID-19-related labour market shocks have impacted individual subjective well-being.

This paper makes several contributions to the literature. First, as stated, to our knowledge this is one of the first papers to examine how the COVID-19 pandemic relates to subjective well-being. Secondly, we add to the existing body of literature in relation to the determinants of subjective well-being more generally, as well as considering domains that have not been explored previously. Thirdly, because of the potential for different effects on people at different points in the subjective well-being distribution, we also apply distributional analyses to investigate these phenomena.

Some research has been done on the social and economic effects of COVID-19. For example, Botha et al. (2020) find substantial negative effects on the financial well-being of Australians stemming directly from job loss and salary reductions due to COVID-19. There have also been reports of large negative income and wealth shocks due to the pandemic (Hanspal et al., 2020) in addition to evidence of substantial negative effects on mental health (Brodeur et al., 2020a) and increases in economic anxiety (Fetzer et al.,

2020).[1] The findings from these studies suggest that the impact of the pandemic on individual subjective well-being is and will likely continue to be substantial.

One study most related to our paper is de Pedraza et al. (2020), using data from the Living and Working in Coronavirus Times (LWCV) 2020 survey. They found that people are more dissatisfied with life and more anxious if their income decreased due to COVID-19 or a friend or family member was diagnosed with the virus. Our paper differs from that of de Pedraza et al. (2020) in that we consider a broad range of domain satisfactions as well as applying different analytical techniques to study how subjective well-being has been impacted by COVID-19 infections and labour market shocks.

The remainder of this paper is structured as follows: Section 2 discusses the data, variables, and econometric approaches used. Section 3 presents the results, and Section 4 discusses the implications of the results and concludes.

2. Data and analytical strategy

2.1 Data

The data were collected during March to July 2020 using an online survey, COVID-19 and YOUR Wellbeing at the University of Melbourne.[2] The survey included a variety of questions on factors such as individual demographics, personal events experienced due to COVID-19, and subjective well-being. We use data from respondents from the six main responding countries: Australia, Germany, US, UK, Spain, and Italy. The final sample includes 5,699 respondents who indicated that they were at least 18 years of age. To ensure that the sample is representative of the general population in each country, we constructed population weights based on age and gender population data available from each country's national statistics agencies. All analyses are thus population weighted for the specific country.

2.2 Outcome variables

We consider six subjective well-being outcomes. We measure overall life satisfaction by asking respondents: "How satisfied are you personally with your life as a whole?" We also consider five additional domain satisfactions, namely satisfaction with health, family life, finances, health services, and health of family members. Domain satisfaction ratings were

[1] For a comprehensive review of the economics of COVID-19, see Brodeur et al. (2020b).
[2] Ethical approval for the project was obtained from the University of Melbourne Human Research Ethics Committee (Approval ID: 2056701.1).

elicited by asking respondents: "How satisfied are you personally with your [domain]?" All items are measured on an 11-point scale ranging from 0 (completely dissatisfied) to 10 (completely satisfied). Distributions of all outcome variables are displayed in Figure 1 and summary statistics for the outcomes are reported in Table 1.

Figure 1. Distributions of subjective well-being variables

2.3 Explanatory variables

The main explanatory variables relate to a health shock and labour market shocks. For a health shock, respondents were asked to indicate whether they or any other household member (i) had been officially diagnosed with COVID-19, or (ii) had explicit symptoms consistent with COVID-19, or (iii) suspected they had COVID-19. This indicator (H_i) equals 1 if a person respondent "yes," and 0 otherwise.

In terms of labour market shocks, respondents were asked whether any of the following events occurred *specifically because of COVID-19*: (i) reduced working hours, (ii) reduced wage/salary, (iii) loss of employment or business closure, and (iv) filing for unemployment benefits/insurance/assistance. As these four shocks are closely related, we considered

several combinations of them. First, an indicator (S_{ws}) is constructed that equals 1 if a respondent experienced reduced working hours together with a reduction in salary. Second, we construct an indicator equaling 1 if a respondent experienced job loss or had to apply for unemployment benefits (S_{jb}), and 0 otherwise. From these two variables, we construct an indicator (S_i) equal to 1 if a respondent reported either S_{ws} or S_{jb}. For the purpose of this paper, we consider S_i as the labour market shock of interest.[3]

Table 1: Summary statistics

Variable	Obs	Mean	S.D.	Min	Max
Satisfaction with life	4,694	6.25	2.31	0	10
Satisfaction with family life	4,669	6.51	2.50	0	10
Satisfaction with family health	4,677	6.36	2.43	0	10
Satisfaction with health	4,653	6.81	2.31	0	10
Satisfaction with health services	4,682	7.33	2.55	0	10
Satisfaction with finances	4,623	6.02	2.75	0	10
Any COVID-19 labour market shock	5,699	0.35	0.48	0	1
Diagnosed with COVID-19	5,699	0.15	0.36	0	1
Male	5,699	0.50	0.50	0	1
Age: 18-24	5,699	0.11	0.31	0	1
Age: 25-34	5,699	0.23	0.42	0	1
Age: 35-44	5,699	0.23	0.42	0	1
Age: 45-54	5,699	0.24	0.43	0	1
Age: 55-64	5,699	0.18	0.38	0	1
Australia	5,699	0.47	0.50	0	1
UK	5,699	0.27	0.42	0	1
USA	5,699	0.14	0.35	0	1
Germany	5,699	0.09	0.29	0	1
Italy	5,699	0.04	0.19	0	1
Spain	5,699	0.03	0.18	0	1
Household size	5,699	2.80	1.31	1	6
Occupation: Not employed	5,641	0.09	0.28	0	1
Occupation: Manager	5,641	0.10	0.30	0	1
Occupation: Professional	5,641	0.37	0.48	0	1
Occupation: Trades Workers	5,641	0.06	0.24	0	1
Occupation: Personal Service	5,641	0.06	0.23	0	1
Occupation: Clerical	5,641	0.08	0.27	0	1
Occupation: Sales	5,641	0.04	0.20	0	1
Occupation: Machinery Operations	5,641	0.01	0.11	0	1
Occupation: Labourer	5,641	0.02	0.12	0	1
Occupation: Other	5,641	0.17	0.37	0	1

Note: Data are weighted by each respective country's population weights.

[3] We also constructed an indicator for whether a respondent reported both S_{ws} and S_{jb}. About 17% of the sample experienced *both* labour market shocks. However, this group will likely be more selective, and the focus on whether a person experienced at least one labour market shock ensures that the measure is broader and accounts for more people. Moreover, the results for how subjective well-being is associated with having experienced all labour market shocks are very similar to the results we present here, apart from the fact that in most cases the effects are, not surprisingly, somewhat larger for persons who experienced *both* labour market shocks. All results for having reported both labour market shocks are available on request.

Additional control variables include a weekly time trend, country dummies, the respondent's self-reported age group, gender, occupation, and household size. Although ideally a wider range of controls are preferable, given the 10-minute response limit of the survey, additional explanatory variables were not possible. Summary statistics are shown in Table 1.

2.4 Estimation methods

We assume that each subjective well-being outcome, swb_i, is a function of COVID-19 labour market shocks S_i, COVID-19 infection or health shocks H_i, and a set of additional stansdard control variables, X_i. Thus, the general equation estimated takes the form:

$$swb_i = \alpha_i + \beta_i S_i + \delta_i H_i + \theta_i X_i + \varepsilon_i \qquad (1)$$

where β_i and δ_i are the main parameters of interest and ε_i a normally distributed error term. To investigate the average change in swb_i, equation (1) is first estimated via standard OLS (see, for example, Ferrer-i-Carbonell and Frijters, 2004). Theoretically, we would expect a negative association between COVID-19 labour market shocks and infections with subjective well-being. Thus, having experienced a labour market shock or having oneself or another household member diagnosed with COVID-19 should have a negative effect on reported subjective well-being.

Although the results from equation (1) would give an indication of the average relationship between subjective well-being and the variables of interest, it is also possible that the relationship of subjective well-being with COVID-19 labour market shocks and infections may depend not only on averages but also on where in the subjective well-being *distribution* these effects occur. We estimate *unconditional* quantile regressions to investigate how COVID-19 infections and labour market shocks differ across the subjective well-being distribution. For this purpose, we use the Firpo et al. (2009) unconditional quantile approach, where relevant coefficients are interpreted as the treatment effect at a given point in the subjective well-being distribution. These regressions are estimated for the standard 10th, 25th, 50th, 75th, and 90th percentiles of the subjective well-being distribution.

One drawback of using quantile regression in this context is that quantile regression is better suited to continuous variables, whereas the subjective well-being measures in this paper are discrete in nature (see Figure 1). Also, whereas quantile regression may indicate the size of an effect at a specific point in the distribution, it does not reflect the mass of

observations affected at each distribution point. Therefore, in this paper we also apply *distribution regression* (see Chernozhukov et al., 2013, 2020a, 2020b; van Kerm, 2015) to examine possible differences in how COVID-19 labour market shocks and infections may be related across the subjective well-being distribution. Another advantage of distribution regression is that it takes into account the volume of observations at each point in the distribution. Thus, we are able to consider the effect size *and* the observation volume at each point: for example, quantile regression may suggest a large effect at the lower part of the distribution, but very often the sample size is relatively small at that point in the distribution; distribution regression would indicate where the largest effects are, in terms of both the size of the effect as well as how many people are affected. In this sense, distribution regression provides a more holistic picture of how subjective well-being responded to COVID-19 labour market shocks and infections.

To implement distribution regression, we start from equation (1) and replace the dependent variable swb_i with a series of dummy variables, swb_{ik} (k = 0, …, 9), such that:

$$
\begin{aligned}
&swb_{i0} = 1 \text{ if } swb_i > 0, \text{ and 0 otherwise} \\
&swb_{i1} = 1 \text{ if } swb_i > 1, \text{ and 0 otherwise} \qquad (2) \\
&swb_{i2} = 1 \text{ if } swb_i > 2, \text{ and 0 otherwise} \\
&\ldots \\
&swb_{i9} = 1 \text{ if } swb_i > 9, \text{ and 0 otherwise}
\end{aligned}
$$

Given 11 discrete values of swb_i, we then estimate 10 separate linear probability models to obtain a separate estimate for the regressors for the dependent variable being greater than the threshold in question. The distribution regression results are presented graphically, which will indicate exactly where in the distribution the largest impacts, if any, of COVID-19 labour market shocks and COVID-19 infection diagnoses are. An interesting feature of distribution regression is that the sum of the 10 individual distribution regression coefficients for each explanatory variable is exactly equal to the OLS regression coefficient. Thus, we can identify the specific *contribution* of each component (the coefficient from the linear probability models) in the distribution to an overall OLS coefficient.

In addition, after estimating the set of 10 linear probability models, we simulate a counterfactual distribution for the 'treated' population (i.e. for those who indeed experienced a labour market shock and/or infection). For instance, for those individuals who experienced a COVID-19 shock (S_i, H_i), we calculate (i) an observed distribution of subjective well-being, and (ii) a counterfactual distribution of subjective well-being for those same individuals, that removes the impact of the S_i or H_i shock at each discrete value of the subjective well-being distribution. This allows us to determine what the subjective well-being distribution for the treated would have been, had the treated group *not* experienced the specific COVID-19 shock. Finally, given the presence of significant distributional differences in how COVID-19 shocks impacted subjective well-being, for the treated group we calculate a Gini inequality coefficient for the observed and counterfactual distributions separately. Thus, we are also able to observe the effects of having been impacted by a COVID-19 shock on subjective well-being *inequality*.

3. Results

3.1 OLS regression results

Table 2 presents the abbreviated OLS regression results (see Table A1 in the Appendix for the full results), reporting the coefficients of the main variables of interest, namely COVID-19 labour market shocks and a COVID-19 diagnosis. On average, labour market shocks due to COVID-19 had a substantial negative effect on subjective well-being, although the magnitudes differ depending on the well-being domain considered. For instance, having experienced any of the two labour market shocks is significantly related to lower life satisfaction of 0.63 points (on the 0-10 scale) compared to persons who did not experience such a shock. This association is much larger for *financial* satisfaction, however, where people who experienced a labour market shock report on average a 1.73-point lower level of satisfaction with finances relative to those who did not experience this shock.

The association between subjective well-being and COVID-19 infections is also negative and is significant for most domains, but notably the coefficients are smaller than labour market shocks in the life satisfaction and financial satisfaction equations. Interestingly, reporting a COVID-19 infection is significantly associated with about 0.47- and 0.45-points lower satisfaction with family life and satisfaction with family health, respectively.

There are also some interesting results with respect to the additional control variables (see Table A1). Compared to females, males report higher satisfaction with finances,

family health, own health, and health services. There are no gender differences in life- and family-life satisfaction, and also very little evidence of age differences in all satisfaction domains. In terms of occupation, persons who are not employed are less satisfied in most domains relative to persons in most occupation categories.

There are strong effects for household size: It is clear that being a single-person household is worse for well-being than living in a household with other members as well. For example, individuals in two-person households report 0.84-points higher life satisfaction and 1.9-points higher family-life satisfaction compared to those who live alone. Moreover, people in 3- and 4-person households report about 1.1-point higher health satisfaction than people who live alone and, not surprisingly, about 2-points higher satisfaction with family life.

Finally, some country differences in subjective well-being are worth highlighting. Residents of the UK, US, and Spain all report significantly higher life satisfaction compared to Australians. Germans have greater financial satisfaction than Australians, whereas Australian residents also report lower levels of satisfaction with family life relative to those in the UK and Spain. Interestingly, Germans are more satisfied with their health services than Australians are and, whereas compared to Australia those in the US report higher satisfaction with family health, they report lower satisfaction with health services.

Table 2: OLS regression results of subjective well-being

	Life overall	Finances	Family health	Health	Health services	Family life
Any labour market shock	-0.632***	-1.733***	-0.322**	-0.213*	-0.486***	-0.367***
	(0.125)	(0.151)	(0.135)	(0.1212)	(0.144)	(0.133)
Diagnosed with COVID-19	-0.250*	-0.518***	-0.454***	-0.283*	-0.178	-0.470***
	(0.140)	(0.183)	(0.147)	(0.166)	(0.192)	(0.170)
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Week time trend	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	4,694	4,623	4,677	4,653	4,682	4,669
Adjusted R_2	0.113	0.198	0.075	0.058	0.092	0.106
F	11.6***	19.0***	8.0***	5.8***	6.9***	10.0***

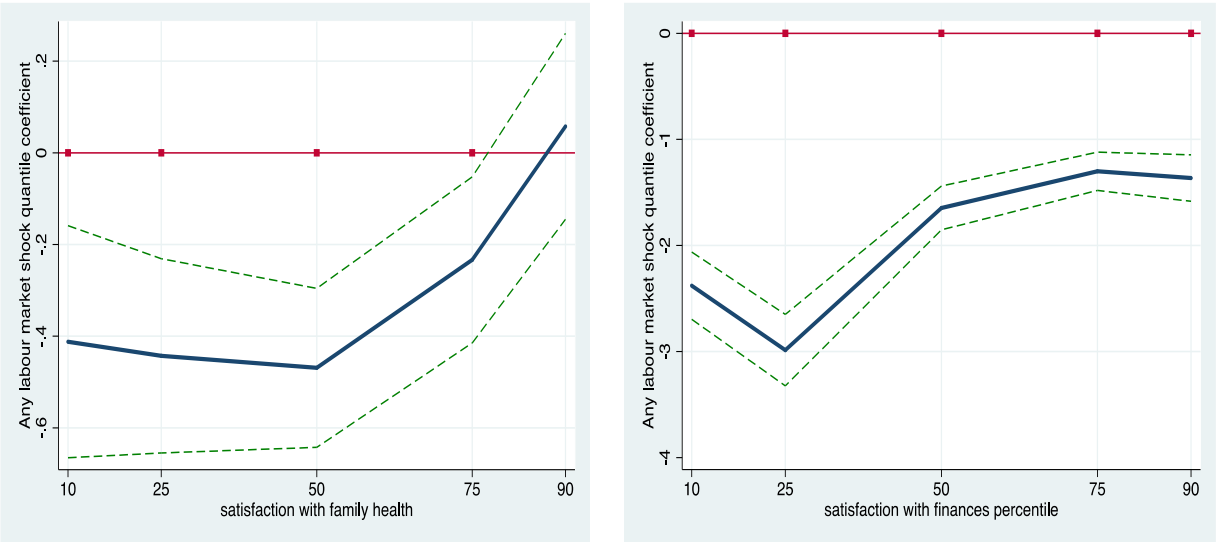
Note: Standard errors in brackets. $p < 0.01$***, $p < 0.05$**, $p < 0.10$*. Full results in Table A1.

3.2 Quantile regression results

The quantile regression results are presented in Figure 1, including point estimates (thick blue line) and 95% confidence intervals (dashed green lines). We present graphical results only for the cases in which there are clear differences in estimates across quantiles. Coefficient estimates for the main variables of interest are presented in Table A2.[4]

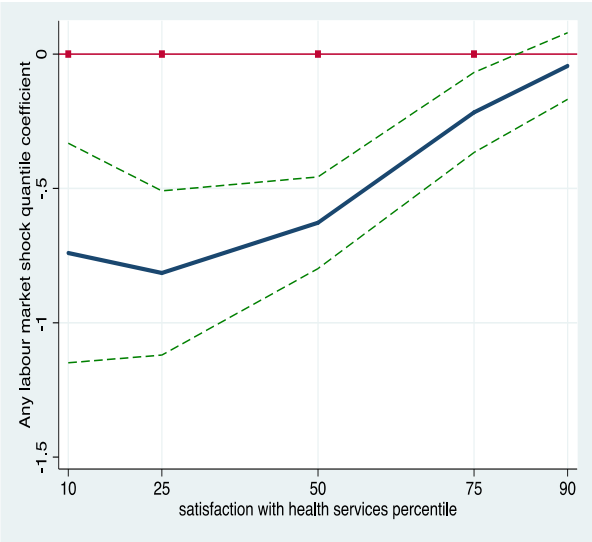
From Figure 1, the largest negative impact[5] of experiencing any labour market shock on satisfaction with family health is in the lower half of the distribution, with a similar pattern evident for satisfaction with health services and family life. Looking at financial satisfaction, the largest effect was for those in the 25th percentile. Results from estimates of the interquartile range (Table A2), show significant differences between the 10th and 90th percentiles and between the 25th and 75th percentiles for satisfaction with finances, health services, and family life. There is also a significant difference between the 10th and 90th percentile for satisfaction with family health.

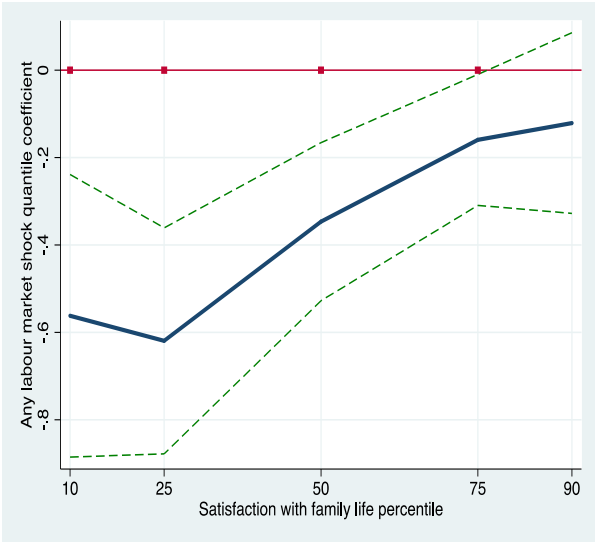
Figure 1. Quantile regression results



4 Due to volume of regression output, the full quantile regression estimates and other corresponding figures are available on request.

5 Coefficients significantly different from zero are indicated by the green dashed 95% confidence intervals and a red dot on the zero line.





3.3 Distribution regression results

The results from the distribution regression estimations, with significant differences across the distribution, are presented in Figures 2 to 4. Coefficient estimates for the variables of interest are shown in Table A3.[6] In cases where there are differences across the subjective well-being distribution, we furthermore present the factual and counterfactual distributions for treated persons as well as the corresponding Gini coefficients.

Together with the various estimates, we also conduct hypothesis tests of (i) whether the coefficients at each point in the distribution are statistically *equal to zero*, and of (ii) whether the coefficients at each point in the distribution are statistically *equal to each other*. For there to be evidence of differences across the subjective well-being distributions, both hypotheses should be rejected. As reported in Table A3, there is no evidence of any differences in how COVID-19 *infections* affect subjective well-being over the distribution, as we fail to reject the null in all cases for all domains. In contrast, COVID-19 *labour market shocks* do indeed exhibit significant differences over the distributions of all satisfaction domains, except that of satisfaction with family life.

We here present figures from the distribution regression results for satisfaction with life, finances, and family health. Figure 2 presents the graphical representation of the coefficient estimates for the association of having experienced any labour market shocks

[6] The complete distribution regression results and graphs are available on request.

on satisfaction with life. The upper pane of Figure 2 displays the estimated coefficients of the linear probability models for $swb_i > k$, where k ranges from 0 to 9. As mentioned previously, an interesting feature of distribution regression is that all of the summed-up coefficients presented in the top pane are identically equal to the overall OLS coefficient. Thus, these coefficients can be interpreted as the contribution of that part of the distribution to the overall average treatment effect. For example, on the life satisfaction scale of 0 to 10, the coefficient is the largest in absolute terms at the value of 6. Therefore, at a life satisfaction level of 6 we expect to see the largest *volume* in the negative effects, i.e. the largest distributional component in the overall average treatment effect.

In the middle pane of Figure 2 we plot the cumulative density function of life satisfaction for those observed to have experienced any labour market shocks. Using the coefficients estimated in the top pane, we counterfactually remove from the treated the differing negative impacts of having reported any labour market shocks and create the counterfactual cumulative density function (red dashed line). This counterfactual distribution becomes clearer in the bottom pane in which the observed distribution of the treated (blue histogram bars) is compared to the counterfactual distribution (red histogram bars), having removed the negative impact of labour market shocks, as estimated in the top pane. The red distribution shifts right, with large increases for those having counterfactually chosen values of life satisfaction of 7 through 10. Correspondingly for those counterfactually deemed to not to have experienced any labour market shocks, their values of 3 through 6 are much lower in prevalence. Indeed, the distribution median shifts from observed 6 to counterfactual 7, indicating a substantial magnitude.

These changing distributions impact on well-being *inequality* as well. Those observed to have experienced any labour market shocks have a Gini inequality coefficient of 0.213, whereas counterfactually, it would only have been 0.196, had these shocks counterfactually not been experienced by the *same* individuals. Thus, the effect of having experienced any COVID-19 labour market shocks shifts the mass of the life satisfaction distribution to the left and at the same time increases well-being inequality.

The results are quite similar for satisfaction with family health (Figure 3). As with life satisfaction, the largest negative effect of a labour market shock is at the family-health satisfaction level of 6. Moreover, the observed distribution shifted to the right as well, and inequality in satisfaction with family life increased from 0.201 in the counterfactual case to 0.231. Lastly, for satisfaction with finances (Figure 4), there are substantial

negative effects of COVID-19 labour market shocks across the distribution. The largest negative impact on financial satisfaction is at a value of 5, although there is a very similar large effect from values 3 to 7 on the distribution, suggesting a very large impact on many individuals (where the mass of the distribution is located). The observed distribution of financial satisfaction shifted much further to the left of the counterfactual distribution. Correspondingly, financial satisfaction inequality rose substantially with the Gini increasing from 0.21 to 0.28, or by about 35 percent.

Figure 2. Any labour market shocks and distribution of satisfaction with life

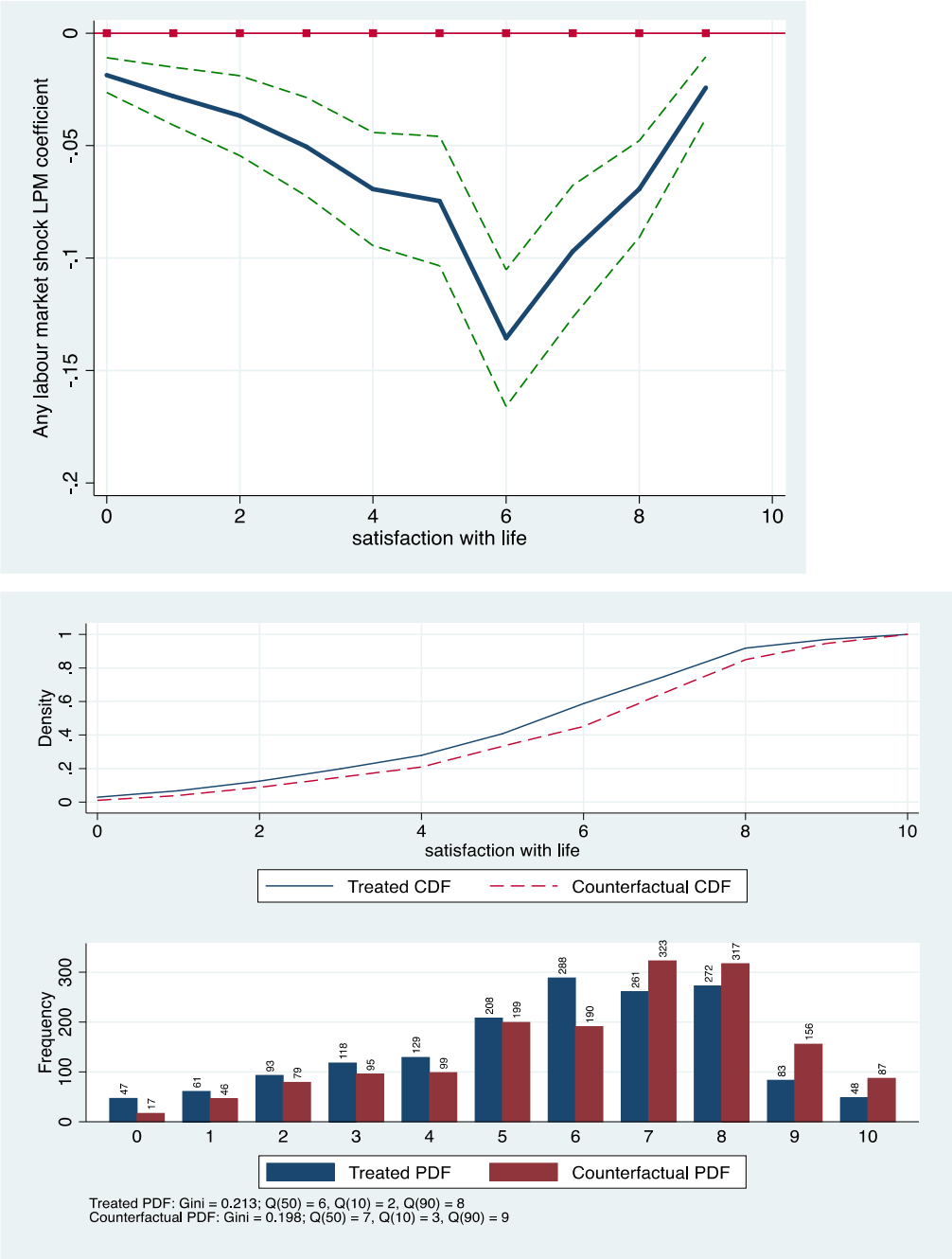


Figure 3. Any labour market shocks and distribution of satisfaction with family health

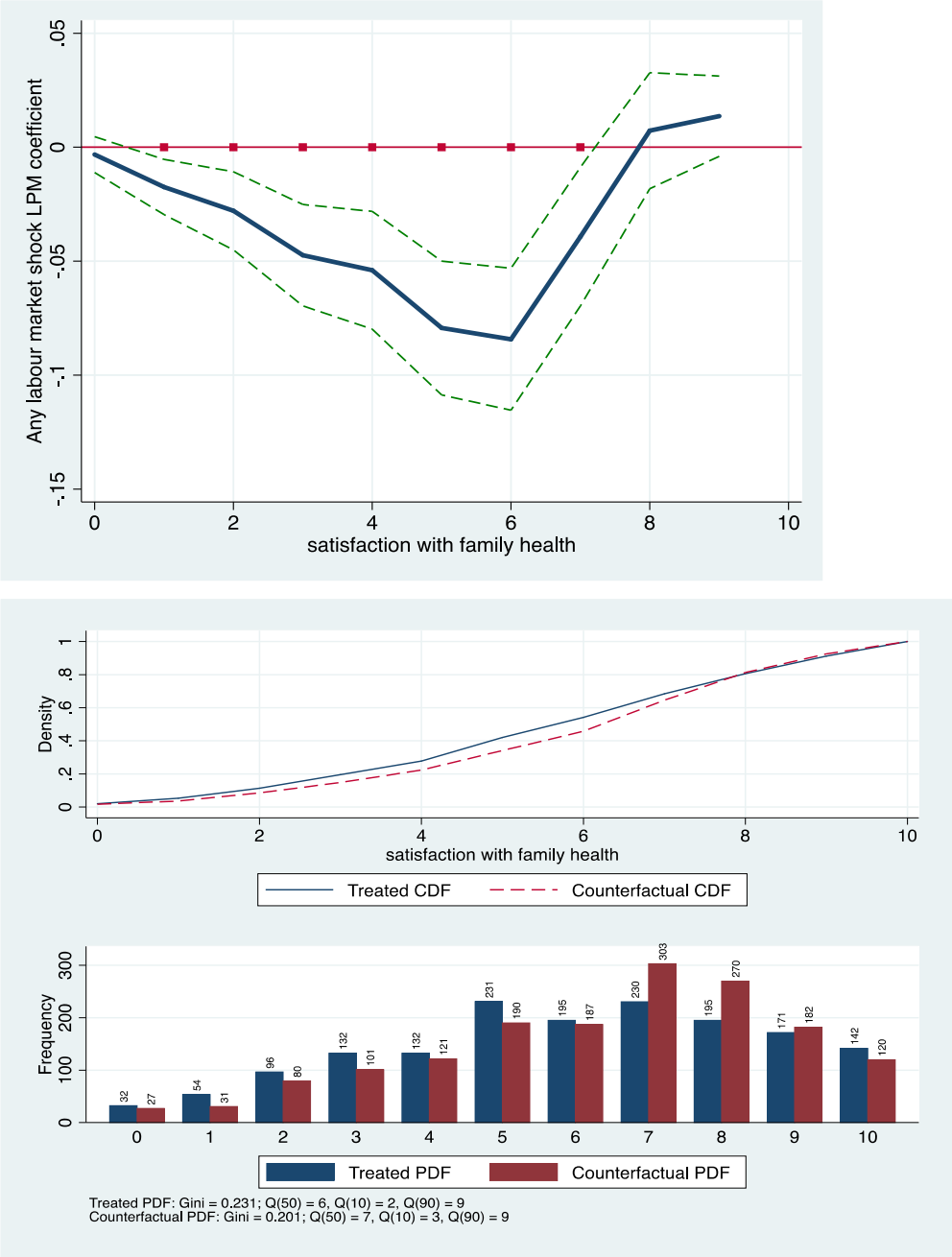
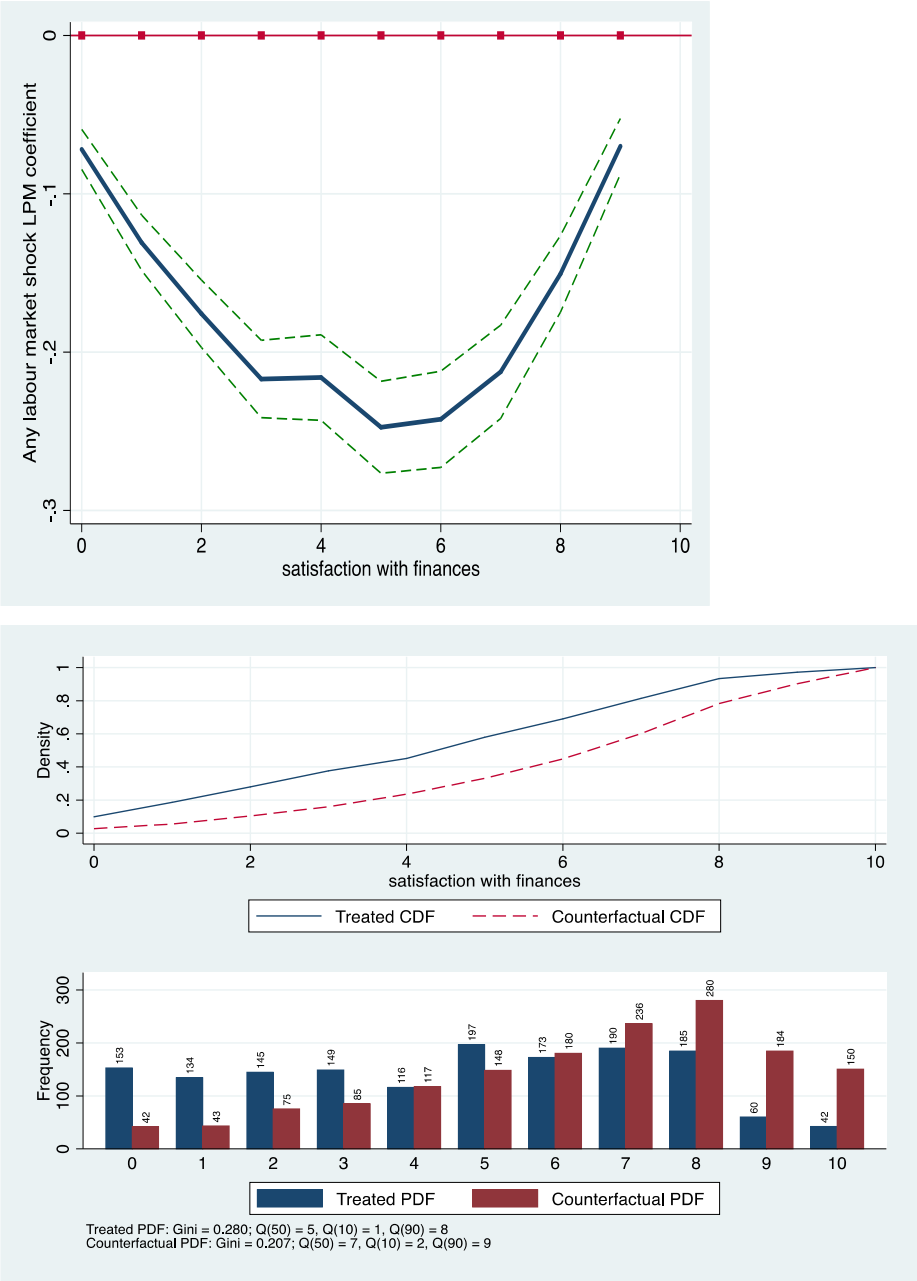


Figure 4. Any labour market shocks and distribution of satisfaction with finances



4. Conclusion

In this paper, we provide the first analysis of the manner in which the COVID-19 pandemic has affected individual subjective well-being. Using a unique online survey of more than 5,000 respondents in the US, UK, Germany, Spain, Italy and Australia, we consider labour market shocks directly due to COVID-19 and prevalence of oneself or a household member being infected by COVID-19. We apply a range of analytical methods, including OLS-, unconditional quantile-, and distribution regression as well as the construction of a

counterfactual subjective well-being distribution for individuals who experienced a labour market shock.

The results indicate that, on average, labour market shocks due to COVID-19 had a strong and significant negative impact on individual well-being. Having been oneself diagnosed or a household member being diagnosed with the virus was also associated with lower levels of subjective well-being, albeit at a lower magnitude than labour market shocks.

Unconditional quantile regression estimates indicate that labour market shocks have a larger effect on subjective well-being at the lower end of the distribution. When considering the distribution regression findings, we observe that although the largest impact of COVID-19 labour market shocks may be at the lower end of the subjective well-being distribution, the largest overall effect on the subjective well-being distribution is generally not at the lowest part of the distribution, but rather in the middle of the distribution, as there the largest mass of the distribution is located.

By far the largest negative impact of the labour market shocks was on the financial satisfaction domain. This is not necessarily a surprising finding, given that factors such as job loss and reductions in salary and working hours have direct negative income effects, which would naturally translate to lower financial satisfaction. This is consistent with previous research (e.g. Kassenboehmer and Haisken-DeNew, 2009; Clark and Georgellis, 2013) reflecting the strong negative impact of unemployment on individual well-being.

The results from distribution regression highlighted that COVID-19 labour market shocks affect most of the subjective well-being domains heterogeneously depending on one's position in the distribution. The largest shifts in the subjective well-being distribution generally occur toward the middle portion of the distribution. When considering the counterfactual distributions for treated individuals, it is clear that labour market shocks shifted the subjective well-being distribution much further to the left than what the distribution would have been, in the absence of any shock. Furthermore, the results also point to a significant increase in subjective well-being *inequality* due to COVID-19 labour market shocks.

There are some limitations of this paper that should be noted. First, although we have data only over a limited number of weeks, it is not a panel, and we cannot control for unobserved individual heterogeneity using standard estimators. Second, we cannot make any strong claims with respect to causality as the countries in question were affected in

a similar manner at the same time, obviating any difference-in-difference or regression discontinuity strategy. Although, given the pandemic nature of the virus, it is unlikely that the single individual would be able to affect the kinds of dramatic economy-wide impacts experienced, and as such, there is a large degree of exogeneity of the labour market impacts experienced by the individual persons. Lastly, only a limited set of explanatory variables could be included in the models, as it was not possible to elicit more responses in light of the limited 10-minute timeframe of the survey.

This paper has shown the broad extent to which the COVID-19 pandemic has affected individual well-being. An interesting insight is that labour market shocks resulting from lockdowns and economic restrictions had a larger impact on well-being than virus infections (health shocks) themselves. Obviously, the health shock estimates are only a lower bound estimate as seriously ill inhabitants of the countries would likely not be able even to respond to the survey due to their poor health state. Those who are unemployed are likely to be unaffected in their ability to respond, barring any resulting severe mental illness. It should also be noted that the overwhelming majority of people who contract the virus would recover relatively quickly (a small percentage of course become very ill and/or die), whereas becoming unemployed is likely a much more longer-term negative shock on finances and emotional health (see, for example, Clark et al., 2001; Kassenboehmer and Haisken-DeNew, 2009; Powdthavee, 2012; Clark and Georgellis, 2013; Clark and Lepinteur, 2019; Brodeur et al., 2020a).

Financial satisfaction especially was adversely affected among those who experienced labour market shocks, which reflects the underlying income shocks as a result of factors such as job loss or reductions in working hours. Moreover, differences across the subjective well-being distribution in response to labour market shocks imply a strong heterogeneous effect.

COVID-19, at least in terms of its effect on unemployment, salary reductions, and infections, has clearly had large significant and heterogeneous impacts on individual well-being, across a range of well-being domains. These findings suggest that continued employment programs will be essential to mitigate the worst negative labour market effects. Moreover, whereas unemployment assistance and unemployment insurance programs in many countries are necessary, the replacement rates are nowhere near the levels of own earned income, indicating a continued economic hardship for quite some time to come. The focus of government policy should be on *real* job sustainability and

job creation (and not just jobs-in-name); these two factors will likely improve people's subjective well-being the most.

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Appendix

Table A1. OLS models for SWB: Any COVID-19 labour market shock and infections

	Life overall	Finances	Family health	Health	Health services	Family life
Any labour market shock	-0.632***	-1.733***	-0.322**	-0.213*	-0.486***	-0.367***
	(0.125)	(0.151)	(0.135)	(0.121)	(0.144)	(0.133)
Diagnosed with COVID-19	-0.250*	-0.518***	-0.454***	-0.283*	-0.178	-0.470***
	(0.140)	(0.183)	(0.147)	(0.166)	(0.192)	(0.170)
Male	0.088	0.406***	0.526***	0.306**	0.277**	0.190
	(0.121)	(0.139)	(0.126)	(0.120)	(0.140)	(0.125)
Country *(Comparison: Australia)*						
UK	-0.044	-0.049	0.102	0.148	-0.161	0.376**
	(0.166)	(0.194)	(0.165)	(0.165)	(0.205)	(0.182)
USA	0.511***	0.126	0.574***	0.410**	-0.389**	0.117
	(0.153)	(0.178)	(0.158)	(0.165)	(0.183)	(0.181)
Germany	0.427***	0.619***	0.525	0.170	0.830***	0.169
	(0.165)	(0.153)	(0.170)	(0.171)	(0.173)	(0.176)
Italy	-0.014	0.124	0.867***	0.570**	-0.010	-0.096
	(0.210)	(0.248)	(0.261)	(0.234)	(0.208)	(0.302)
Spain	0.866***	0.280	0.813**	0.601***	0.489	0.637***
	(0.228)	(0.345)	(0.409)	(0.220)	(0.449)	(0.247)
Occupation *(Comparison: Not employed)*						
Manager	1.666***	2.049***	1.410***	0.968***	0.750**	1.171***
	(0.220)	(0.295)	(0.235)	(0.232)	(0.330)	(0.245)
Professional	1.547***	1.905***	1.485***	0.683***	0.924***	0.811***
	(0.120)	(0.276)	(0.203)	(0.202)	(0.283)	(0.235)
Trade worker	1.218***	1.015**	1.024***	0.877***	-0.205	1.218***
	(0.304)	(0.460)	(0.314)	(0.323)	(0.404)	(0.355)
Personal service	0.946***	1.269***	1.034***	0.422*	0.285	0.511*
	(0.333)	(0.347)	(0.323)	(0.236)	(0.358)	(0.261)
Clerical	1.360***	1.612***	1.490***	0.438*	0.860**	0.734***
	(0.225)	(0.313)	(0.259)	(0.234)	(0.344)	(0.256)
Sales	0.528	0.490	0.778**	0.456	0.478	0.185
	(0.352)	(0.555)	(0.353)	(0.427)	(0.397)	(0.345)
Machinery operator	1.113***	0.694	0.984*	-0.200	-1.027*	0.179
	(0.421)	(0.627)	(0.576)	(0.518)	(0.579)	(0.576)
Labourer	0.047	0.552	1.418**	0.805	-1.524*	0.344
	(0.536)	(0.517)	(0.605)	(0.516)	(0.806)	(0.659)
Other	0.988***	1.111***	1.018***	0.723***	0.168	0.483*
	(0.231)	(0.294)	(0.223)	(0.225)	(0.311)	(0.259)
Age group (Comparison: 18-24)						
25-34	-0.053	-0.507	-0.397	-0.055	-0.335	-0.124
	(0.291)	(0.335)	(0.279)	(0.254)	(0.298)	(0.267)
35-44	0.420	-0.180	-0.212	0.106	-0.126	0.267
	(0.283)	(0.314)	(0.270)	(0.233)	(0.277)	(0.250)
45-54	0.070	-0.262	-0.404	-0.363	-0.108	0.107
	(0.282)	(0.314)	(0.261)	(0.236)	(0.273)	(0.252)
55-64	0.546**	0.024	-0.202	-0.176	-0.004	0.207
	(0.276)	(0.318)	(0.257)	(0.236)	(0.269)	(0.249)
Household size (Comparison: 1 person)						
2 persons	0.844***	0.376*	0.059	0.762***	0.538***	1.876***
	(0.176)	(0.197)	(0.184)	(0.179)	(0.184)	(0.209)
3 persons	0.611***	0.102	0.319	1.082***	0.178	1.879***

	Life overall	Finances	Family health	Health	Health services	Family life
	(0.205)	(0.213)	(0.200)	(0.199)	(0.211)	(0.233)
4 persons	0.698***	0.339	0.202	1.187***	0.310	2.184***
	(0.199)	(0.223)	(0.206)	(0.202)	(0.219)	(0.225)
5 persons	0.608*	0.109	-0.248	0.913***	0.687***	2.064***
	(0.328)	(0.299)	(0.301)	(0.284)	(0.248)	(0.278)
6 or more persons	0.549*	-0.487	0.066	0.909**	-0.684	1.950***
	(0.316)	(0.364)	(0.344)	(0.368)	(0.502)	(0.327)
Week of year	0.014	0.036*	-0.027	-0.019	-0.019	0.017
	(0.016)	(0.019)	(0.017)	(0.017)	(0.019)	(0.017)
Constant	4.000***	4.208***	5.645***	5.720***	7.097***	3.668***
	(0.545)	(0.637)	(0.524)	(0.484)	(0.587)	(0.528)
N	4,694	4,623	4,677	4,653	4,682	4,669
Adjusted R_2	0.113	0.198	0.075	0.058	0.092	0.106
F	11.6***	19.0***	8.0***	5.8***	6.9***	10.0***

Note: Standard errors in brackets. $p < 0.01$***, $p < 0.05$**, $p < 0.10$*.

Table A2. Unconditional quantile estimates for main variables of interest

	Life overall	Finances	Family health	Health	Health services	Family life
Unconditional quantiles: Any labour market shock						
OLS	-0.632***	-1.733***	-0.322***	-0.213***	-0.486***	-0.367***
	(0.090)	(0.082)	(0.077)	(0.074)	(0.080)	(0.078)
10th percentile	-0.627***	-2.379***	-0.412***	-0.114	-0.740***	-0.562***
	(0.155)	(0.162)	(0.129)	(0.186)	(0.208)	(0.165)
25th percentile	-0.587***	-2.986***	-0.443***	-0.273**	-0.815***	-0.619***
	(0.109)	(0.172)	(0.108)	(0.110)	(0.156)	(0.132)
50th percentile	-0.657**	-1.646***	-0.469***	-0.310***	-0.628***	-0.347***
	(0.075)	(0.105)	(0.088)	(0.087)	(0.087)	(0.092)
75th percentile	-0.464***	-1.301***	-0.234**	0.283***	-0.217***	-0.160**
	(0.072)	(0.092)	(0.092)	(0.073)	(0.076)	(0.076)
90th percentile	-0.722***	-1.365***	0.058	-0.006	-0.044	-0.121
	(0.114)	(0.112)	(0.104)	(0.092)	(0.063)	(0.105)
IQR (10, 90)	-0.120	1.015***	0.462*	0.108	0.720*	0.482*
	(0.320)	(0.379)	(0.266)	(0.291)	(0.384)	(0.271)
IQR (25, 75)	0.110	1.682***	0.221	0.006	0.621**	0.508**
	(0.183)	(0.321)	(0.188)	(0.168)	(0.247)	(0.200)
Unconditional quantiles: Infection						
OLS	-0.250***	-0.518***	-0.454***	-0.283***	-0.178*	-0.470***
	(0.090)	(0.104)	(0.098)	(0.094)	(0.102)	(0.099)
10th percentile	0.067	-0.627***	-0.427***	-0.670***	-0.229	-0.595***
	(0.196)	(0.206)	(0.164)	(0.235)	(0.264)	(0.208)
25th percentile	-0.188	-0.819***	-0.370***	0.314**	-0.032	-0.367**
	(0.137)	(0.219)	(0.137)	(0.137)	(0.197)	(0.166)
50th percentile	-0.266***	-0.504***	-0.468***	-0.133	-0.065	-0.243**
	(0.095)	(0.134)	(0.112)	(0.110)	(0.110)	(0.116)
75th percentile	-0.232***	-0.418***	-0.491***	-0.030	-0.210**	-0.428***
	(0.091)	(0.117)	(0.117)	(0.092)	(0.096)	(0.096)
90th percentile	-0.297**	-0.465***	-0.433***	-0.037	-0.136*	-0.231*
	(0.144)	(0.142)	(0.131)	(0.116)	(0.080)	(0.133)
IQR (10, 90)	-0.323	0.161	0.014	0.657	0.069	0.480
	(0.324)	(0.446)	(0.292)	(0.416)	(0.526)	(0.382)
IQR (25, 75)	-0.008	0.412	-0.114	0.289	-0.175	0.072
	(0.229)	(0.367)	(0.248)	(0.209)	(0.330)	(0.266)

Note: Standard errors in brackets. $p < 0.01$***, $p < 0.05$**, $p < 0.10$*. IQR denotes estimates for the interquartile range, with IQR (10, 90) being the interquartile range of the 10th and 90th percentile, and IQR (25, 75) being the interquartile range of the 25th and 75th percentile. Full results are available on request.

Table A3. Distribution regression estimates for main variables of interest

	Life overall	Finances	Family health	Health	Health services	Family life
Panel A: Parameter for any labour market shock						
OLS	-0.632***	-1.733***	-0.322***	-0.213***	-0.486***	-0.367***
	(0.090)	(0.082)	(0.077)	(0.074)	(0.080)	(0.078)
Distribution regression						
$swb_i > 0$	-0.019***	-0.072***	-0.003	0.000	-0.005	-0.003
	(0.004)	(0.015)	(0.005)	(0.005)	(0.007)	(0.006)
$swb_i > 1$	-0.028***	-0.131***	-0.017*	-0.003	-0.027*	-0.014
	(0.007)	(0.020)	(0.010)	(0.010)	(0.014)	(0.010)
$swb_i > 2$	-0.037***	-0.176***	-0.028**	-0.013	-0.017	-0.031**
	(0.009)	(0.023)	(0.014)	(0.012)	(0.016)	(0.013)
$swb_i > 3$	-0.051***	-0.217***	-0.047***	-0.006	-0.034*	-0.033*
	(0.011)	(0.025)	(0.018)	(0.014)	(0.018)	(0.020)
$swb_i > 4$	-0.069***	0.216***	-0.054**	-0.029*	-0.059***	-0.061***
	(0.013)	(0.026)	(0.022)	(0.018)	(0.020)	(0.023)
$swb_i > 5$	-0.075***	-0.247***	-0.079***	-0.054**	-0.068***	-0.051**
	(0.015)	(0.026)	(0.026)	(0.023)	(0.023)	(0.025)
$swb_i > 6$	-0.136***	-0.242***	-0.084***	-0.056**	-0.088***	-0.060**
	(0.016)	(0.026)	(0.027)	(0.026)	(0.025)	(0.026)
$swb_i > 7$	-0.097***	-0.212***	-0.039	-0.063**	-0.112***	-0.034
	(0.015)	(0.024)	(0.026)	(0.028)	(0.026)	(0.027)
$swb_i > 8$	-0.069***	-0.151***	0.007	-0.001	0.045*	-0.015
	(0.011)	(0.015)	(0.025)	(0.024)	(0.026)	(0.022)
$swb_i > 9$	-0.024***	-0.070***	0.014	0.040**	-0.009	0.003
	(0.007)	(0.011)	(0.019)	(0.018)	(0.023)	(0.014)
$H_0: \beta_k = 0$	χ^2 = 45.9 p = 0.000	χ^2 = 167.7 p = 0.000	χ^2 = 21.2 p = 0.020	χ^2 = 23.0 p = 0.011	χ^2 = 35.5 p = 0.000	χ^2 = 13.9 p = 0.176
$H_0: \beta_k = \beta_l$	χ^2 = 28.7 p = 0.001	χ^2 = 95.1 p = 0.000	χ^2 = 21.0 p = 0.012	χ^2 = 22.6 p = 0.007	χ^2 = 34.8 p = 0.000	χ^2 = 13.7 p = 0.133
Panel B: Parameter for COVID-19 infection						
OLS	-0.250***	-0.518***	-0.454***	-0.283***	-0.178*	-0.470***
	(0.090)	(0.104)	(0.098)	(0.094)	(0.102)	(0.099)
Distribution regression						
$swb_i > 0$	0.002	0.006	-0.006	-0.009	-0.007	-0.012
	(0.005)	(0.011)	(0.006)	(0.010)	(0.009)	(0.011)
$swb_i > 1$	0.000	-0.034*	-0.030***	-0.022	-0.007	-0.017
	(0.008)	(0.021)	(0.011)	(0.013)	(0.013)	(0.013)
$swb_i > 2$	0.004	-0.042*	-0.029**	-0.042**	-0.027	-0.033*
	(0.011)	(0.024)	(0.014)	(0.019)	(0.024)	(0.019)
$swb_i > 3$	-0.014	-0.059**	-0.029	-0.035*	-0.011	-0.021
	(0.014)	(0.026)	(0.020)	(0.021)	(0.026)	(0.022)
$swb_i > 4$	-0.022	-0.080***	-0.045*	-0.033	-0.025	-0.036
	(0.016)	(0.031)	(0.027)	(0.023)	(0.029)	(0.028)
$swb_i > 5$	-0.041**	-0.078**	-0.057*	-0.015	-0.003	-0.050
	(0.019)	(0.032)	(0.031)	(0.028)	(0.031)	(0.032)
$swb_i > 6$	-0.055***	-0.074**	-0.084**	-0.024	-0.022	-0.042
	(0.020)	(0.034)	(0.035)	(0.034)	(0.033)	(0.034)

	Life overall	Finances	Family health	Health	Health services	Family life
swb$_i$ > 7	-0.049***	-0.068**	-0.082**	-0.007	-0.012	-0.090***
	(0.019)	(0.033)	(0.033)	(0.036)	(0.035)	(0.035)
swb$_i$ > 8	-0.028**	-0.051*	-0.054*	-0.006	-0.044	-0.029
	(0.014)	(0.027)	(0.028)	(0.035)	(0.036)	(0.029)
swb$_i$ > 9	-0.003	-0.023	-0.017	-0.007	-0.029	0.006
	(0.009)	(0.023)	(0.020)	(0.020)	(0.027)	(0.023)
$H_0: \delta_k = 0$	χ^2 = 5.1	χ^2 =11.4	χ^2 = 13.1	χ^2 =6.7	χ^2 = 12.0	χ^2 = 13.2
	p = 0.887	p = 0.330	p = 0.221	p = 0.750	p = 0.284	p = 0.212
$H_0: \delta_k = \delta_l$	χ^2 = 4.9	χ^2 = 11.3	χ^2 = 11.3	χ^2 = 5.6	χ^2 = 11.1	χ^2 = 12.4
	p = 0.842	p = 0.258	p = 0.257	p = 0.776	p = 0.272	p = 0.193

Note: Standard errors in brackets. p < 0.01***, p < 0.05**, p < 0.10*. Full results are available on request. $H_0: \beta_k = 0$ is a χ^2 test with 10 degrees of freedom and is the joint test of whether the coefficients of labour market shocks are each equal to zero, thus $H_0: \beta_k = 0 \; \forall \; k, k \in Y$. Furthermore, $H_0: \beta_k = \beta_l$ is a χ^2 test with 9 degrees of freedom and is the joint test of whether the coefficients of labour market shocks are all equal to each other, thus $H_0: \beta_k = \beta_l \; \forall \; k \neq l, \; k, l \in Y$. The same tests apply to joint tests of the infection coefficients.