

Università degli Studi di Padova
Dipartimento di Scienze Economiche e Aziendali M. Fanno

EXPLORING THE IMPACT OF MENTAL HEALTH ON INDIVIDUAL OUTCOMES: AN INSTRUMENTAL VARIABLES APPROACH USING SHARE DATA

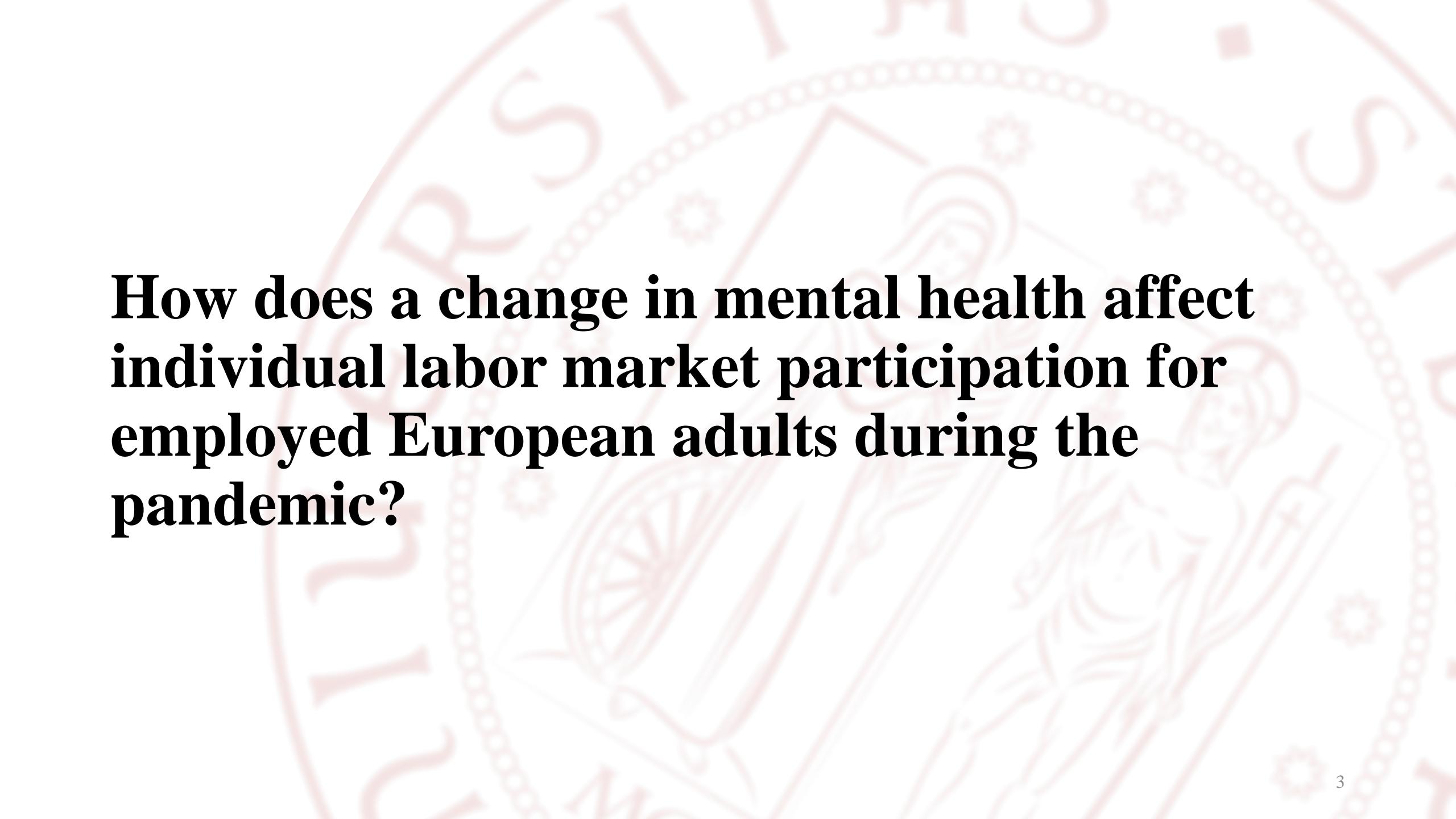
Supervisor: Prof. Elisa Tosetti

A.Y. 2022-2023

Author: Jessica Cremonese

Agenda

- **1. Research Question**
- 2. Mental Health Overview
- 3. Datasets and Variables
- 4. Methodology
- 5. Results
- 6. Discussion
- 7. Q&A



How does a change in mental health affect individual labor market participation for employed European adults during the pandemic?

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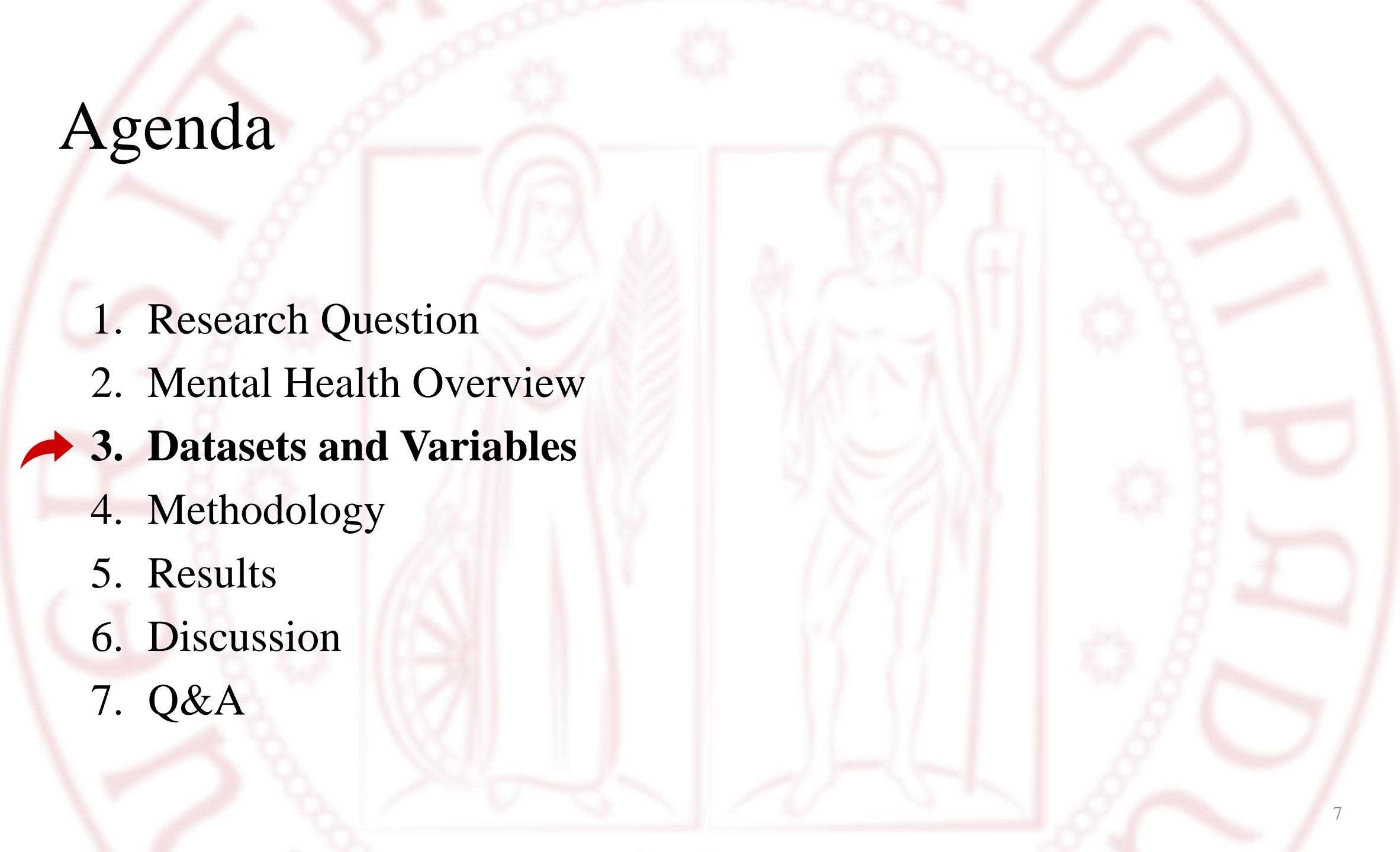
What is Mental Health?

- WHO (2022): “A state of well-being in which an individual realizes their own abilities, can cope with normal stresses of life, can work productively and fruitfully, and is able to contribute to their community.”
- WHO (2022): 1/8 people worldwide live with a mental disorder.
- Key Aspects:
 - Encompasses emotional, psychological and social well-being.
 - Affects decision-making, stress management, and interpersonal relationships.
 - Impacts productivity, job satisfaction, and workplace interactions.
 - Poor MH is associated with **labor market performance** through increased **absenteeism, higher turnover, reduced productivity** (OECD/EU 2018, 2022).

COVID-19 and Mental Health

- Pandemic-related risk factors for MH:
 - Social isolation and loneliness
 - Feelings of helplessness
 - Loss of routine
 - Changes and limitations to daily activities
 - Emotional burden of sickness and bereavement
- Elevated rates of **anxiety, depression, sleep problems, and stress-related symptoms** during the pandemic (Pieh et al. (2021), Wang et al. (2020), Adams-Prassl et al. (2022)).
 - Pieh et al. (2021) in the UK: 52% screened positive for common mental disorder, 28% showed signs of clinical insomnia.

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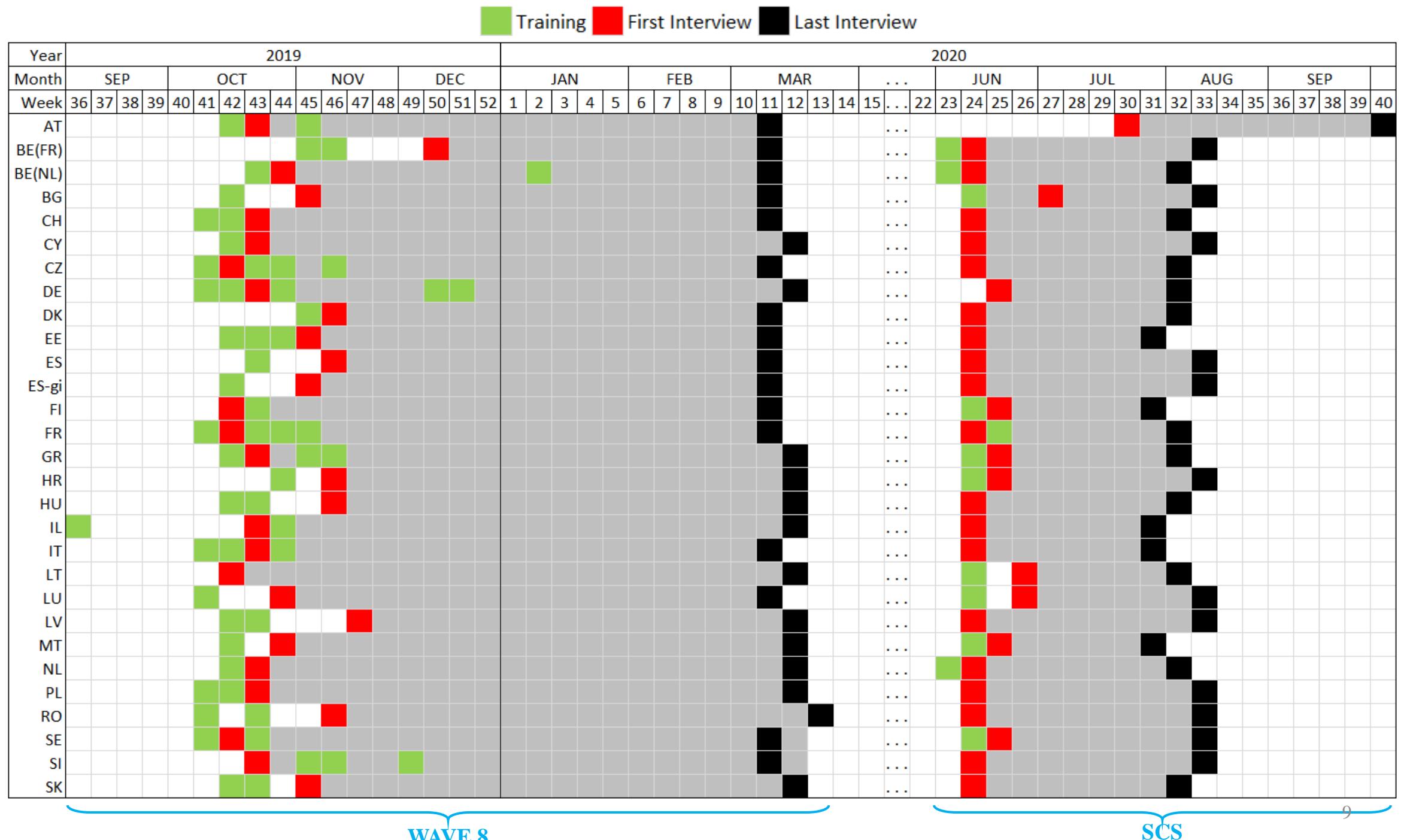
Survey on Health Aging Retirement in Europe (SHARE)

Wave 8

- Cross-national (25 countries), multidisciplinary database.
- Older European adults.
- Collection timing: 2019 – 2020.
- Fieldwork disrupted in March 2020 (70% done).
- Information on individual month of data collection.

Corona Survey (SCS)

- Shorter questionnaire administered in response to W8 fieldwork disruption.
- Data on mental health, COVID-19 symptoms, healthcare, changes in work and economic situation, and social networks.
- Collection timing: June 2020 – August 2020.
- Information on individual month of data collection.



Survey on Health Aging Retirement in Europe (SHARE)

Wave 8

- Covariates information on respondent characteristics:
 - Demographic information
 - Social network characteristics
 - Labor market information
 - Health and daily life

Corona Survey (SCS)

- Dependent Variables:
 1. Having reduced working time since the start of the pandemic.
 2. Having increased working time since the start of the pandemic.
- Mental Health Information to build an index.
- Follow up information on Wave 8 modules.

Oxford Government Response Tracker (OxGRT)

What is OxGRT?

- Dataset collecting information on policy responses to the COVID-19 pandemic.
- Publicly available cross-national and cross-temporal tracking of **government policies and interventions**.
- January 2020 – December 2022.

Stringency Index

- Considers indicators for:
 - School closures
 - Workplace closures
 - Cancellation of public events
 - Restrictions on gatherings
 - Public transportations
 - Stay at home orders
 - Restrictions on internal movement
 - International travel controls
 - Public information campaigns.
- SI varies between 0 (least) and 100 (most).

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Dependent Variables From SCS

Reduced Hours

- Binary indicator of whether the individual has reduced work hours since the start of the pandemic.
- Model 1.

Increased Hours

- Binary indicator of whether the individual has increased work hours since the start of the pandemic.
- Model 2.

Sample: older European adults, employed from start to finish of the pandemic.

Regressor of interest: **MH**.

Mental Health module in SHARE Corona Survey:

- In the last month, have you been **sad or depressed**?
- Has that been more so, less so or about the same as before the outbreak of Corona?
- Have you had **trouble sleeping recently**?
- Has that been more so, less so or about the same as before the outbreak of Corona?
- How much of the time do you **feel lonely**? Often, some of the time, or hardly ever or never?
- Has that been more so, less so or about the same as before the outbreak of Corona?

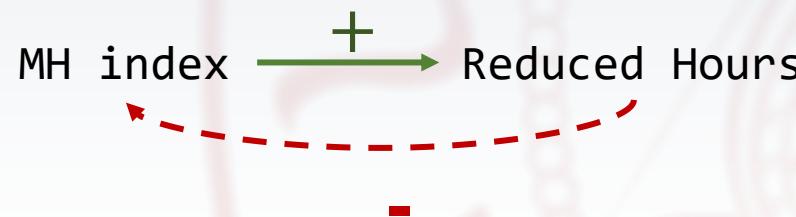
MH index: varies between 0 (no symptoms at all) and 7 (all symptoms, and all are worsened).

IV-Probit

Endogeneity Issues

- Measurement error in MH.
- **Reverse causality** between y and MH.

If y is Reduced Hours:



IV-Probit

- Addresses endogeneity: uses IV to isolate exogenous variation in the endogenous variable (MH).
- Meant for binary dependent variables.
- Estimation: maximum likelihood or two-step estimator.

IV-Probit

First Stage: OLS.

$$MH = \alpha + \mathbf{Z}\gamma + \mathbf{X}\delta + \varepsilon$$

Where $\mathbf{Z} = (z_1, \dots, z_m)$ are relevant and exogenous instruments.

Second Stage: Probit.

$$P(y = 1 | \widehat{MH}, \mathbf{X}) = \Phi(\beta_0 + \beta_1 \widehat{MH} + \beta_2 x_2 + \cdots + \beta_k x_{k-1})$$

with y either Reduced Hours or Increased Hours.

Instrumental Variables

COVID Deaths	Stringency Index Average	New Cases Average
<ul style="list-style-type: none">Number of COVID-19 deaths in the respondent's social network, weighted by type of relationship.	<ul style="list-style-type: none">Monthly average of the Stringency Index.Computed for each individual up to the month of SCS data collection.	<ul style="list-style-type: none">Monthly average of new COVID-19 cases per million inhabitants.Computed for each individual up to the month of SCS data collection.

On Instrumental Variables

Testing instrument validity:

- **Relevance** → the instrument must be a strong predictor of the endogenous variable.
 - Check that $\gamma \neq 0$ in the first stage using Stock and Yogo's critical values.
- **Exogeneity** → the instrument must affect the dependent only through the endogenous variable.
 - Amemiya-Lee-Newey (ALN) minimum chi-square statistic.

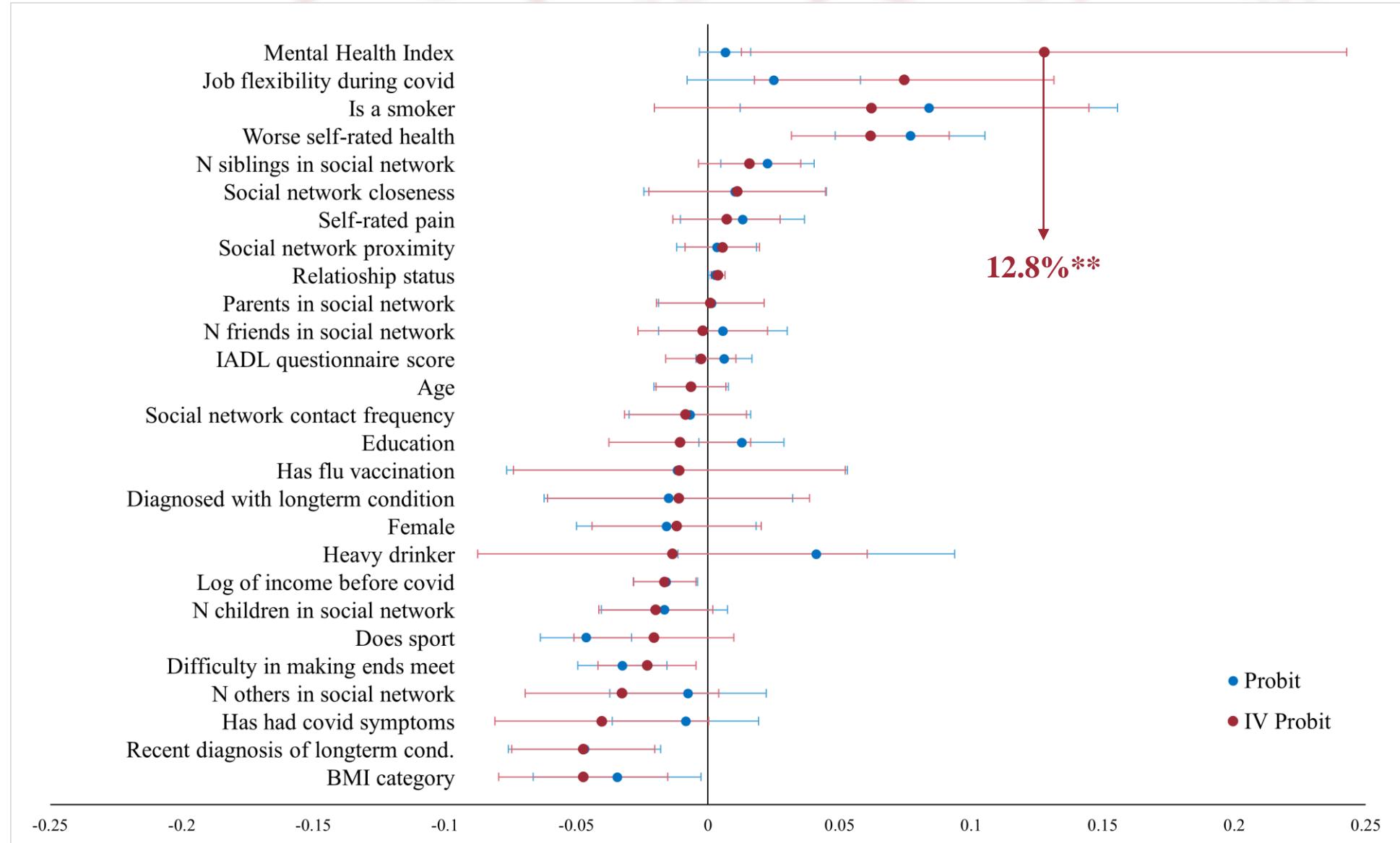
Testing conclusions:

	Relevance	Exogeneity	Included
COVID Deaths	YES	YES	NO
Stringency Index Average	YES	YES	YES
New Cases Average	NO	NO	NO

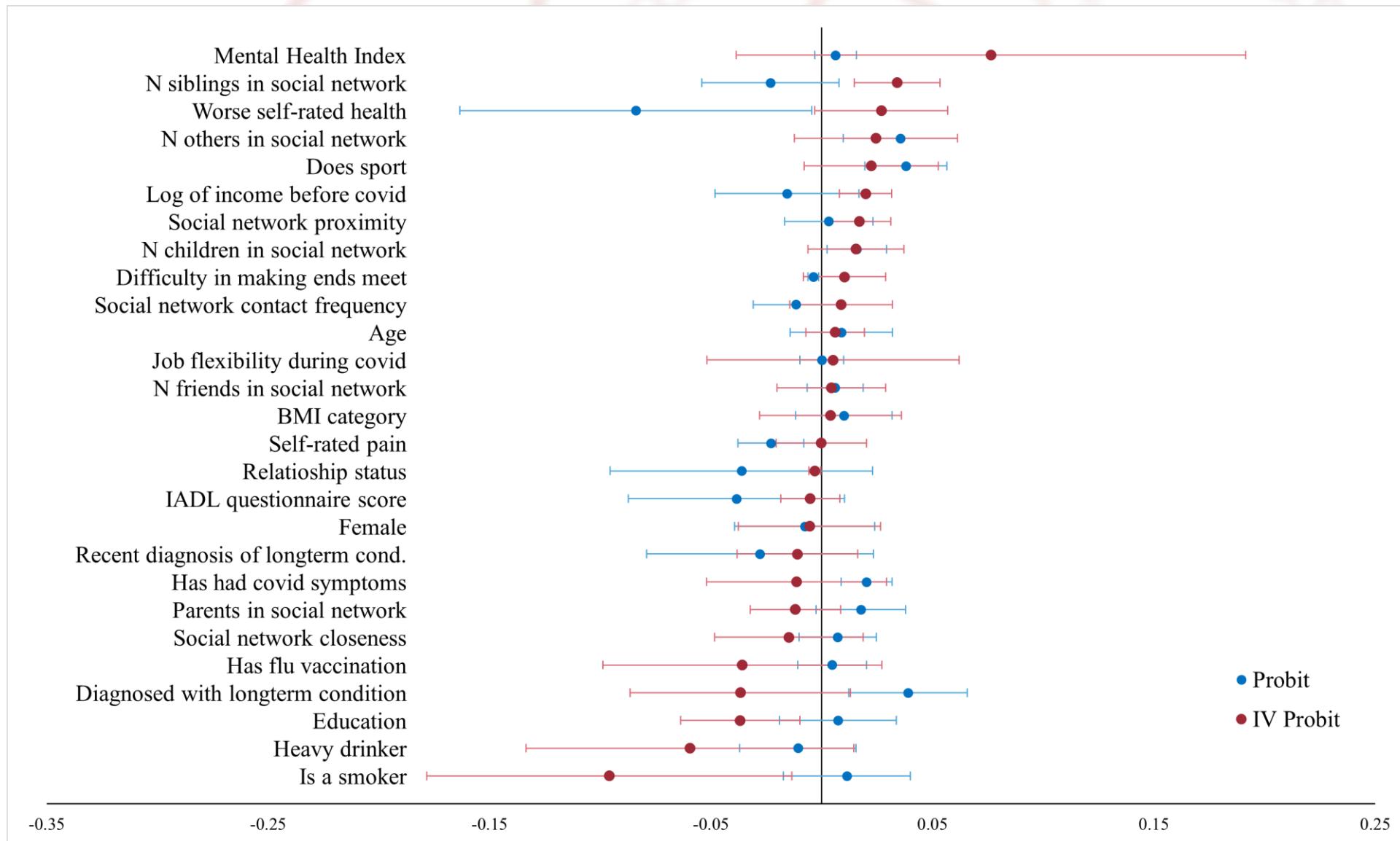
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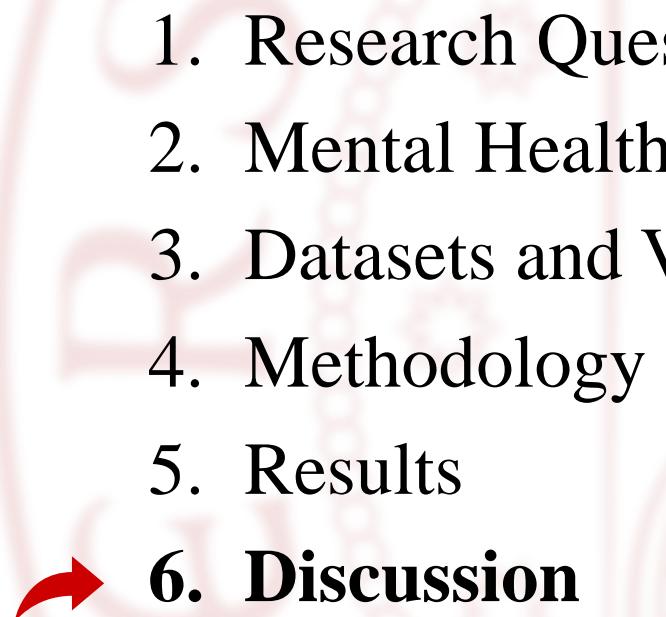
Model 1 Marginal Effects: Reduced Hours



Model 2 Marginal Effects: Increased Hours



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Limitations and discussion

Data limitations:

- Would be preferable to use validated scales for MH such as UCLA or EURO-D.
- Cross-sectional data limits modeling choices.

Modeling implications:

- IV-Probit results are L.A.T.E.
- On the exclusion restriction:
 - Encouraging testing results do not rule out a violation of the restriction.
 - Caution with causal interpretation of the results.

M1 results are indicative of how mental health affects individual work-related choices during extreme events such as a pandemic.

Agenda

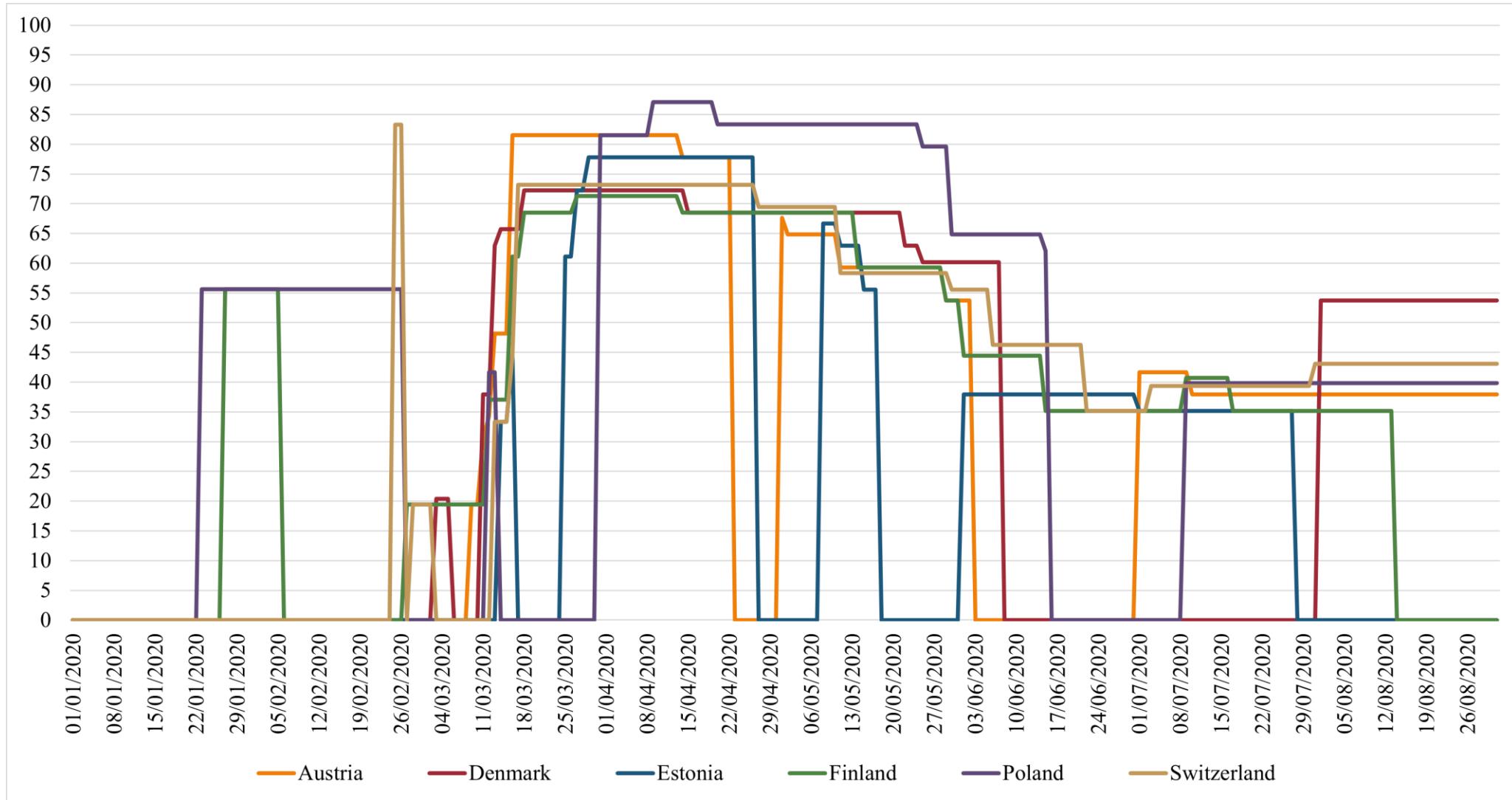
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Q&A

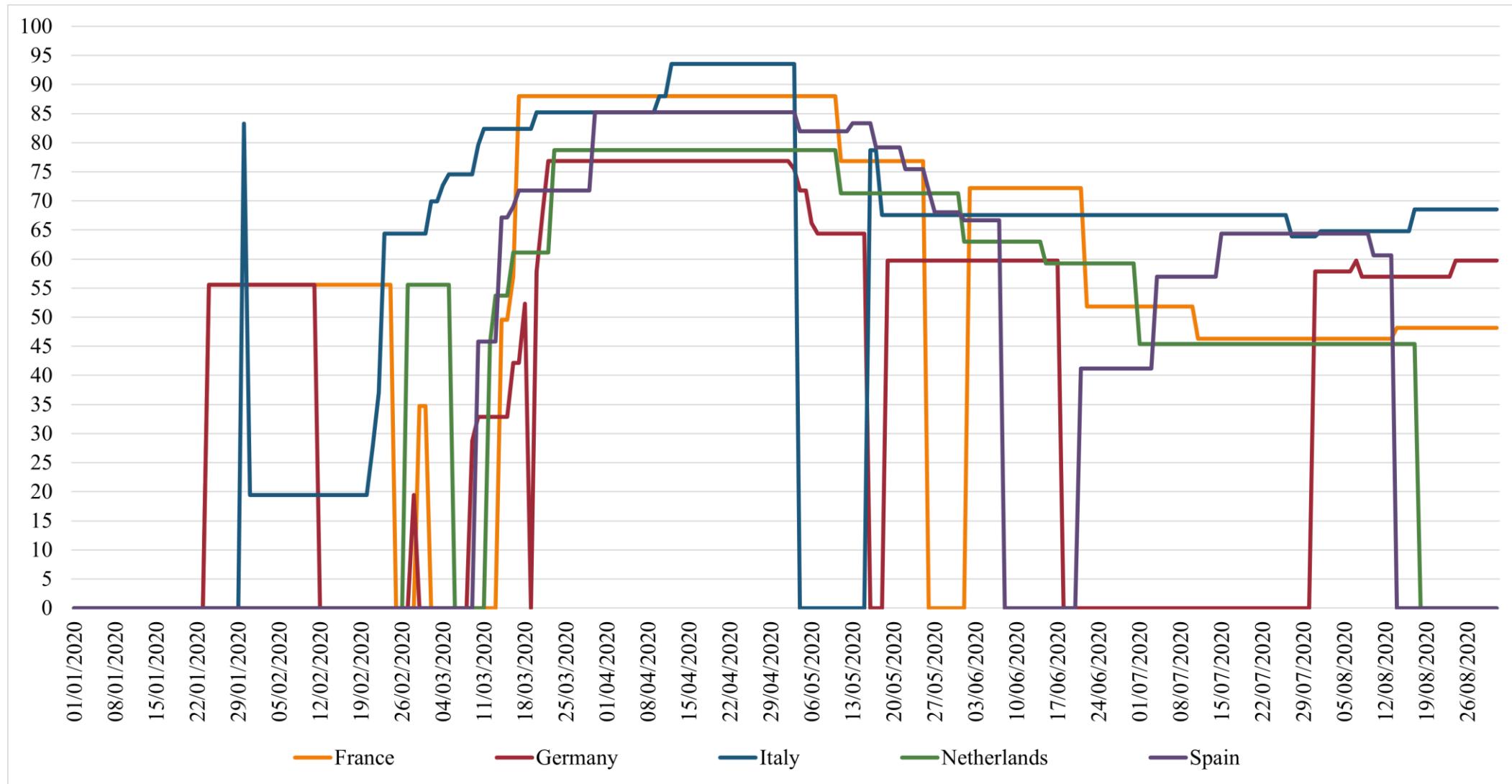
Appendix

Additional Tables and Graphs

Subsample Distribution of the Stringency Index 1/2



Subsample Distribution of the Stringency Index 2/2



Independent Variables in M1 and M2

1/2

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
reduced_hours	Binary indicator for reduced work time since pandemic onset.	2297	0.1659	0.3720	0	1
increased_hours	Binary indicator for increased work time since pandemic onset.	2296	0.1437	0.3509	0	1
mh_ca	Mental health index.	2297	0.8296	1.3224	0	7
age	Age at time of interview.	2297	60.7266	5.4547	37	90
female	Gender.	2297	0.5908	0.4918	0	1
rel_status	Binary indicator for being partnered.	2297	0.7222	0.4480	0	1
isced97educ	ISCED-97 education level acquired.	2297	3.8633	1.1494	1	6
SN_contact	Average contact frequency with SN members.	2297	1.9304	0.9084	1	6
SN_proximity	Average physical distance from SN members.	2297	3.5358	1.6752	1	8
SN_closeness	Average emotional closeness from SN members.	2297	3.2523	0.5748	1	4
child_SN	Number of living children.	2297	0.8542	0.9523	0	7
sibling_SN	Number of living siblings.	2297	0.2773	0.5845	0	5
parents_SN	Number of living parents.	2297	0.1241	0.3588	0	2
friends_SN	Number of living friends.	2297	0.6670	1.0246	0	7
others_SN	Number of other SN members.	2297	0.1959	0.5513	0	6

Independent Variables in M1 and M2

2/2

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
log_inc_prre_ca	Logarithm of annual income pre-pandemic.	2297	7.5702	0.9219	-2.009	14.627
job_flex_ca	Binary indicator for having experienced flexible work modality since pandemic onset.	2297	0.3875	0.4873	0	1
ends_meet_ca	Ability to make ends meet since pandemic onset.	2297	3.1367	0.8703	1	4
diagnosed_ca	Binary indicator for having been diagnosed with a long-term condition since pandemic onset.	2297	0.0588	0.2352	0	1
ca_symptoms	Binary indicator for having experienced COVID-19 symptoms.	2297	0.0287	0.1671	0	1
longterm_condition	Binary indicator for being diagnosed with a long-term condition.	2297	0.4523	0.4978	0	1
health	Self-assessed health status.	2297	2.7902	0.9414	1	5
pain	Self-assessed pain level.	2297	0.3274	0.4694	0	1
bmi_cat	BMI category.	2297	2.9203	0.7888	1	4
flu_vax	Binary indicator for having received a seasonal flu vaccine in the last year.	2297	0.2138	0.4100	0	1
iadl_score	Instrumental Activities of Daily Living score.	2297	0.0805	0.5247	0	9
smoker	Binary indicator for being a smoker.	2297	0.1872	0.3902	0	1
alcohol	Binary indicator for heavy alcohol drinking.	2297	0.0814	0.2735	0	1
sport	Binary indicator for being physically active.	2297	0.9604	0.1951	0	1

Instrumental Variables Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
covid_death	2297	0.0674793	0.5808128	0	18
upto_month_avg_SI	2297	42.25638	5.149009	34.84262	58.863
upto_month_avg_newcasesperm	2297	14.25918	10.47381	1.535301	49.18575

Table 5.1: Instrumental Variables Summary Statistics.

MLE

In the Probit model, coefficients are estimated using Maximum Likelihood Estimation (MLE). Unlike OLS, coefficients are not directly interpretable as marginal effects. Instead, they indicate the change in the z-score or the number of standard deviations away from the mean of the underlying latent variable for a one-unit change in the predictor.

The likelihood function for the Probit model is given by:

$$L(\beta) = \prod_{i:y_i=1} \Phi(\beta' \mathbf{X}_i)^{y_i} \prod_{i:y_i=0} (1 - \Phi(\beta' \mathbf{X}_i))^{(1-y_i)} \quad (5.9)$$

Here, \mathbf{X}_i is the $n \times (k + 1)$ matrix of independent variables for sample unit i , including a column of ones for the intercept, y_i is individual i dependent variable, and β is the $(k + 1) \times 1$ vector of parameters to be estimated.

MLE

The associated log-likelihood function is given by:

$$\ell(\beta) = \sum_{i=1}^n [y_i \ln \Phi(\beta' \mathbf{X}_i) + (1 - y_i) \ln(1 - \Phi(\beta' \mathbf{X}_i))] \quad (5.10)$$

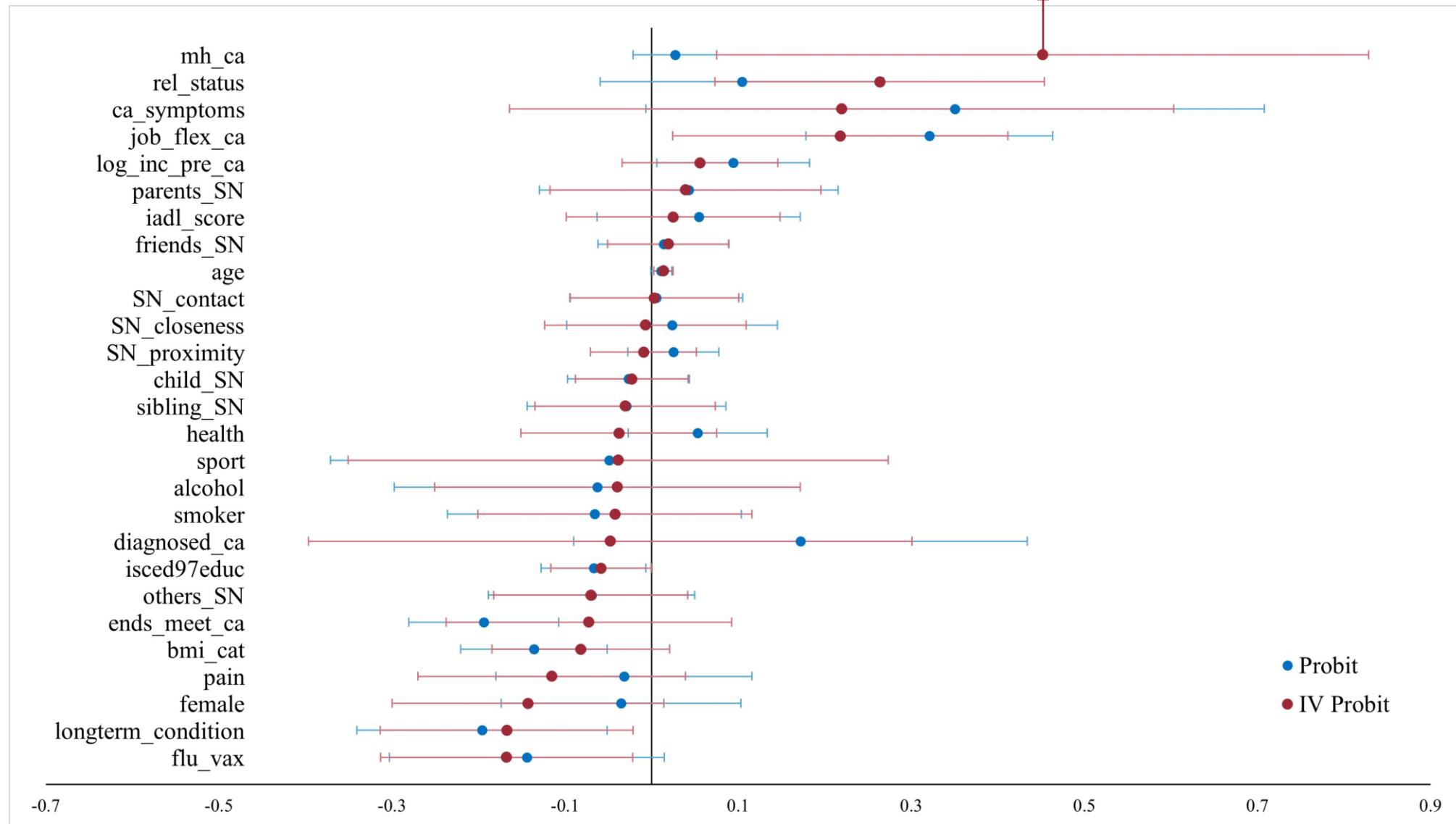
The Probit estimator maximises Equation (5.10) to obtain consistent, asymptotically normal and efficient estimates of the coefficients. To interpret the coefficients, one often calculates the marginal effects:

$$\frac{\partial P(y = 1 | \mathbf{X})}{\partial x_j} = \phi(\beta' \mathbf{X}) \beta_j \quad (5.11)$$

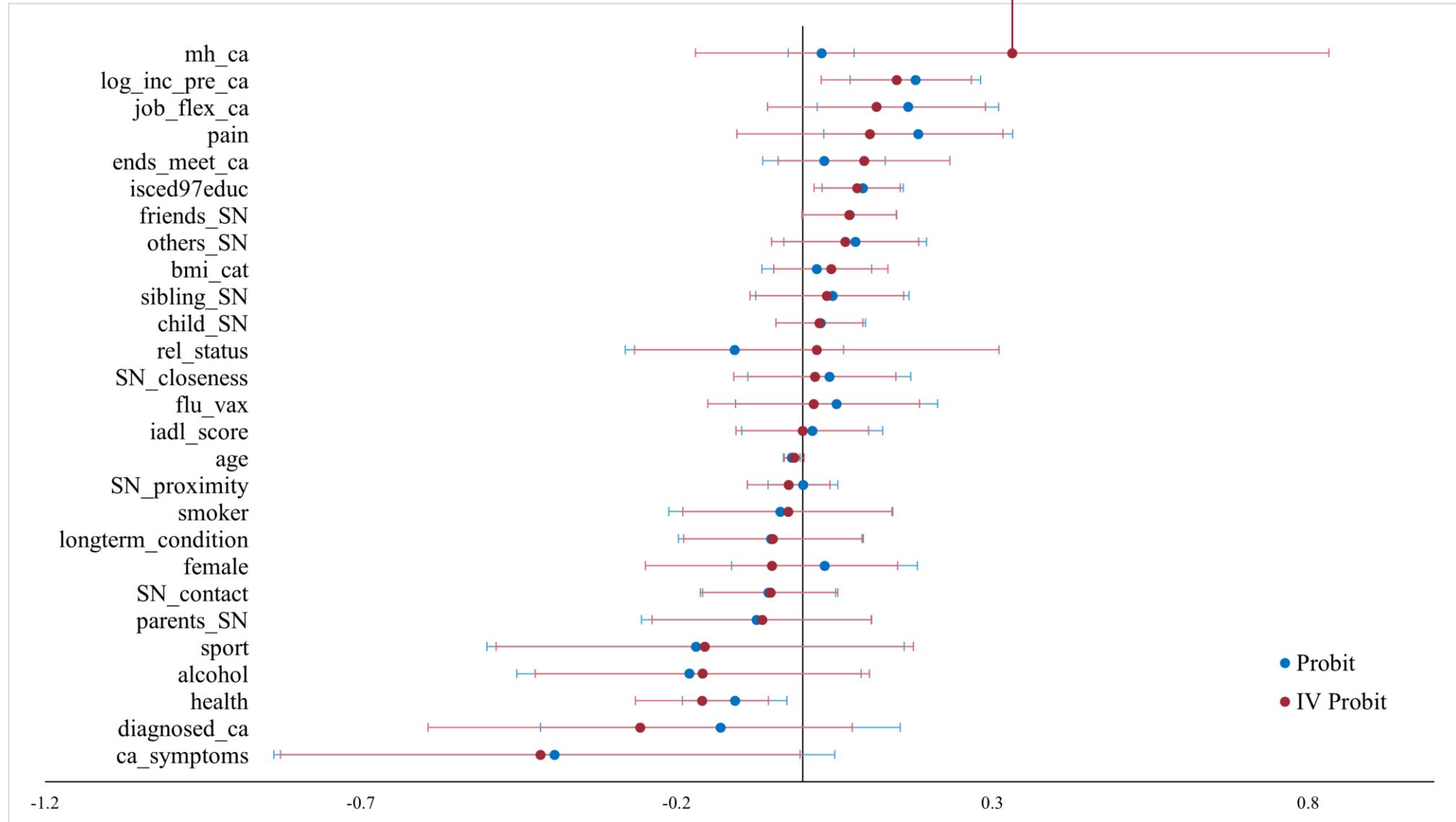
where ϕ is the probability density function of the standard normal distribution. As such, the Probit coefficients themselves are not directly interpretable as the magnitude of the effect, although their associated marginal effects provide valuable insights into the impact of each predictor on the probability of the event of interest. That is, the sign of the effect is given by the sign of β_j .

Model 1: reduced_hours

0.452**



Model 2: increased_hours



M1: second stages

1/3

VARIABLES	(1) Probit reduced_hours	(2) IV Probit reduced_hours	(3) IV Probit reduced_hours	(4) IV Probit reduced_hours	(5) IV Probit reduced_hours	(6) IV Probit reduced_hours
mh_ca	0.0271 (0.0246)	0.452** (0.192)	0.540*** (0.149)	0.124 (0.186)	-0.223 (0.266)	0.196 (0.204)
age	0.0111* (0.00622)	0.0136** (0.00570)	0.0137** (0.00547)	0.0120* (0.00499)	0.00825 (0.00692)	0.0126** (0.00498)
female	-0.0354 (0.0707)	-0.143* (0.0802)	-0.163** (0.0705)	-0.0606 (0.0562)	0.261*** (0.0558)	-0.0791 (0.0561)
rel_status	0.104 (0.0837)	0.264*** (0.0971)	0.295*** (0.0728)	-0.408*** (0.108)	-0.00204 (0.142)	-0.398*** (0.0725)
isced97educ	-0.0669** (0.0309)	-0.0582** (0.0296)	0.0189 (0.0287)	0.0198 (0.0250)	0.00987 (0.0314)	0.0228 (0.0306)
SN_contact	0.00540 (0.0509)	0.00321 (0.0497)	0.00610 (0.0499)	0.00515 (0.0512)	0.00792 (0.0488)	0.00501 (0.0498)
SN_proximity	0.0255 (0.0268)	-0.00929 (0.0313)	-0.0177 (0.0289)	0.0183 (0.0253)	0.0672*** (0.0310)	0.0126 (0.0315)
SN_closeness	0.0236 (0.0620)	-0.00707 (0.0594)	0.0657 (0.0507)	0.0175 (0.0631)	0.0380 (0.0615)	0.0130 (0.0504)
child_SN	-0.0265 (0.0359)	-0.0227 (0.0333)	0.00232 (0.0302)	0.00712 (0.0302)	-0.0244 (0.0302)	-0.0261 (0.0355)
sibling_SN	-0.0289 (0.0587)	-0.0304 (0.0531)	-0.0297 (0.0510)	0.00672 (0.0527)	0.0188 (0.0586)	-0.0306 (0.0575)
parents_SN	0.0430 (0.0880)	0.0392 (0.0798)	-0.0110 (0.0663)	0.0435 (0.0659)	0.0392 (0.0853)	0.0436 (0.0660)
friends_SN	0.0139 (0.0387)	0.0193 (0.0357)	0.0201 (0.0320)	0.0154 (0.0320)	0.00907 (0.0381)	0.0165 (0.0384)
others_SN	-0.0692 (0.0608)	-0.0701 (0.0572)	-0.0664 (0.0535)	0.0205 (0.0531)	-0.0585 (0.0531)	-0.0717 (0.0530)

M1: second stages

2/3

VARIABLES	(1) Probit reduced_hours	(2) IV Probit reduced_hours	(3) IV Probit reduced_hours	(4) IV Probit reduced_hours	(5) IV Probit reduced_hours	(6) IV Probit reduced_hours
log_inc_pre_ca	0.0944** (0.0450)	0.0560 (0.0459)	0.0255 (0.0309)	0.0284 (0.0458)	0.0449 (0.0312)	0.0823* (0.0464)
job_flex_ca	0.321*** (0.0728)	0.218** (0.0988)	0.180* (0.0941)	0.307*** (0.0575)	0.128** (0.0705)	0.293*** (0.0578)
ends_meet_ca	-0.194*** (0.0442)	-0.0724 (0.0842)	-0.203*** (0.0414)	-0.172*** (0.0629)	-0.214*** (0.0555)	-0.153** (0.0700)
diagnosed_ca	0.172 (0.134)	-0.0477 (0.178)	0.445*** (0.164)	0.127 (0.139)	0.275* (0.164)	0.419*** (0.139)
ca_symptoms	0.351* (0.182)	0.220 (0.196)	0.153 (0.183)	0.330* (0.183)	0.381** (0.185)	0.311* (0.183)
longterm_condition	-0.196*** (0.0737)	-0.167** (0.0746)	-0.151** (0.0721)	0.0298 (0.0595)	0.00870 (0.0598)	0.0320 (0.0595)
health	0.0533 (0.0410)	-0.0377 (0.0577)	-0.0601 (0.0334)	0.207*** (0.0332)	0.0985* (0.0330)	0.204*** (0.0578)
pain	-0.0319 (0.0755)	-0.115 (0.0789)	-0.132* (0.0716)	-0.0515 (0.0616)	0.190*** (0.0618)	0.174*** (0.0616)
bmi_cat	-0.136*** (0.0431)	-0.0817 (0.0523)	-0.0633 (0.0352)	-0.0668* (0.0350)	-0.0740** (0.0353)	-0.120** (0.0489)
flu_vax	-0.144* (0.0810)	-0.168** (0.0743)	-0.166** (0.0715)	-0.153* (0.0823)	-0.110 (0.0916)	0.0818 (0.0813)
iadl_score	0.0546 (0.0599)	0.0250 (0.0629)	0.0164 (0.0464)	0.0494 (0.0461)	0.0509 (0.0463)	0.0531 (0.0628)
smoker	-0.0659 (0.0867)	-0.0422 (0.0807)	-0.0344 (0.0698)	-0.0308 (0.0861)	-0.0375 (0.0842)	-0.0299 (0.0857)

M1: second stages

3/3

VARIABLES	(1) Probit reduced_hours	(2) IV Probit reduced_hours	(3) IV Probit reduced_hours	(4) IV Probit reduced_hours	(5) IV Probit reduced_hours	(6) IV Probit reduced_hours
alcohol	-0.0627 (0.120)	-0.0394 (0.108)	-0.0118 (0.0932)	-0.00845 (0.0934)	-0.0248 (0.0939)	-0.0553 (0.117)
sport	-0.0488 (0.164)	-0.0385 (0.159)	-0.0335 (0.155)	0.112 (0.145)	-0.0423 (0.145)	0.111 (0.145)
Constant	-1.464** (0.608)	-1.605*** (0.564)	-0.320 (0.597)	-1.537** (0.582)	0.736 (0.688)	-1.580*** (0.607)
Observations	2,297	2,297	2,297	2,297	2,297	2,297
First Stage Instruments:						
upto_month_avg_SI		X	X	X		X
upto_month_avg_newcasesperm			X		X	X
covid_death				X	X	X
Degrees of overidentification	0	1	1	1		2
Amemiya-Lee-Newey χ^2 stat		1.551	3.281	2.056	7.153	
Prob > χ^2		0.2129	0.0701	0.1516	0.028	

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6.2: Estimation Results for reduced_hours.

M1: first stages

1/4

VARIABLES	(1) OLS mh_ca	(2) OLS mh_ca	(3) OLS mh_ca	(4) OLS mh_ca	(5) OLS mh_ca
age	-0.00609 (0.00500)	-0.00740 (0.00500)	-0.00556 (0.00501)	-0.00831* (0.00499)	-0.00653 (0.00500)
female	0.286*** (0.0567)	0.284*** (0.0565)	0.281*** (0.0566)	0.260*** (0.0561)	0.279*** (0.0565)
rel_status	-0.400*** (0.0735)	-0.389*** (0.0733)	-0.408*** (0.0732)	-0.412*** (0.0735)	-0.400*** (0.0729)
isced97educ	0.0149 (0.0254)	0.0183 (0.0255)	0.0196 (0.0251)	0.0103 (0.0253)	0.0220 (0.0253)
SN_contact	0.0116 (0.0502)	0.00798 (0.0501)	0.0145 (0.0502)	0.00705 (0.0502)	0.0118 (0.0501)
SN_proximity	0.0760*** (0.0256)	0.0774*** (0.0255)	0.0704*** (0.0254)	0.0674*** (0.0254)	0.0715*** (0.0254)
SN_closeness	0.0684 (0.0511)	0.0667 (0.0510)	0.0668 (0.0508)	0.0615 (0.0510)	0.0656 (0.0507)
child_SN	0.00116 (0.0303)	0.00201 (0.0304)	0.00724 (0.0304)	0.00728 (0.0304)	0.00776 (0.0304)
sibling_SN	0.00258 (0.0534)	-0.000235 (0.0532)	0.00713 (0.0530)	0.0186 (0.0526)	0.00498 (0.0529)
parents_SN	-0.0129 (0.0665)	-0.0118 (0.0667)	-0.00345 (0.0663)	0.00237 (0.0665)	-0.00278 (0.0664)

M1: first stages

2/4

VARIABLES	(1) OLS mh_ca	(2) OLS mh_ca	(3) OLS mh_ca	(4) OLS mh_ca	(5) OLS mh_ca
friends_SN	-0.0274 (0.0321)	-0.0280 (0.0321)	-0.0303 (0.0322)	-0.0206 (0.0321)	-0.0307 (0.0322)
others_SN	0.0226 (0.0539)	0.0209 (0.0538)	0.0207 (0.0534)	0.0284 (0.0534)	0.0195 (0.0533)
log_inc_pre_ca	0.0378 (0.0313)	0.0281 (0.0312)	0.0287 (0.0309)	0.0433 (0.0312)	0.0216 (0.0308)
job_flex_ca	0.106* (0.0582)	0.102* (0.0586)	0.112* (0.0578)	0.128** (0.0580)	0.109* (0.0581)
ends_meet_ca	-0.195*** (0.0415)	-0.200*** (0.0416)	-0.200*** (0.0408)	-0.216*** (0.0414)	-0.203*** (0.0411)
diagnosed_ca	0.445*** (0.145)	0.445*** (0.145)	0.418*** (0.140)	0.423*** (0.140)	0.418*** (0.140)
ca_symptoms	0.162 (0.185)	0.155 (0.185)	0.121 (0.185)	0.135 (0.186)	0.116 (0.184)
longterm_condition	0.0241 (0.0601)	0.0264 (0.0600)	0.0293 (0.0599)	0.00867 (0.0602)	0.0309 (0.0599)
health	0.202*** (0.0336)	0.199*** (0.0336)	0.207*** (0.0334)	0.197*** (0.0332)	0.205*** (0.0333)
pain	0.190*** (0.0623)	0.189*** (0.0623)	0.175*** (0.0620)	0.190*** (0.0622)	0.174*** (0.0620)

M1: first stages

3/4

VARIABLES	(1) OLS mh_ca	(2) OLS mh_ca	(3) OLS mh_ca	(4) OLS mh_ca	(5) OLS mh_ca
bmi_cat	-0.0715** (0.0355)	-0.0694** (0.0354)	-0.0669* (0.0352)	-0.0737** (0.0355)	-0.0654* (0.0352)
flu_vax	0.0903 (0.0688)	0.0871 (0.0686)	0.0850 (0.0685)	0.0988 (0.0689)	0.0827 (0.0684)
iadl_score	0.0542 (0.0464)	0.0520 (0.0466)	0.0550 (0.0464)	0.0503 (0.0466)	0.0533 (0.0466)
smoker	-0.0202 (0.0702)	-0.0199 (0.0702)	-0.0312 (0.0692)	-0.0376 (0.0695)	-0.0307 (0.0693)
alcohol	-0.0128 (0.0935)	-0.0112 (0.0936)	-0.00885 (0.0940)	-0.0249 (0.0945)	-0.00776 (0.0941)
sport	0.0351 (0.152)	0.0373 (0.152)	0.112 (0.145)	0.0706 (0.145)	0.112 (0.146)
upto_month_avg_SI	0.0220*** (0.00560)	0.0245*** (0.00600)	0.0213*** (0.00556)		0.0232*** (0.00594)
upto_month_avg_newcasesperm		0.00414 (0.00293)		-0.000613 (0.00273)	0.00306 (0.00290)
covid_death			0.233*** (0.0481)	0.238*** (0.0496)	0.230*** (0.0479)
Constant	-0.392 (0.580)	-0.400 (0.581)	-0.419 (0.578)	0.761 (0.498)	-0.425 (0.579)

M1: first stages

4/4

VARIABLES	(1) OLS mh_ca	(2) OLS mh_ca	(3) OLS mh_ca	(4) OLS mh_ca	(5) OLS mh_ca
upto_month_avg_SI	0.0220*** (0.00560)	0.0245*** (0.00600)	0.0213*** (0.00556)		0.0232*** (0.00594)
upto_month_avg_newcasesperm		0.00414 (0.00293)		-0.000613 (0.00273)	0.00306 (0.00290)
covid_death			0.233*** (0.0481)	0.238*** (0.0496)	0.230*** (0.0479)
Constant	-0.392 (0.580)	-0.400 (0.581)	-0.419 (0.578)	0.761 (0.498)	-0.425 (0.579)
Observations	2,297	2,297	2,297	2,297	2,297
F(m, n-(k+1))	15.39	8.34	19.97	11.54	13.6
Prob >F	0.0001	0.0002	0.0000	0.0000	0.0000
R-squared	0.123	0.124	0.133	0.127	0.134

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6.3: First Stage Estimation Results for reduced_hours.

M2: second stages

1/3

VARIABLES	(1) Probit reduced_hours	(2) IV Probit reduced_hours	(3) IV Probit reduced_hours	(4) IV Probit reduced_hours	(5) IV Probit reduced_hours	(6) IV Probit reduced_hours
mh_ca	0.0294 (0.0266)	0.332 (0.256)	0.292 (0.258)	0.357*** (0.134)	0.374** (0.154)	0.346** (0.136)
age	-0.0176*** (0.00680)	-0.0135* (0.00791)	-0.00727 (0.00496)	-0.0129* (0.00682)	-0.0126* (0.00497)	-0.0131* (0.00686)
female	0.0343 (0.0752)	-0.0493 (0.102)	-0.0378 (0.0562)	0.280*** (0.0562)	-0.0613 (0.0834)	-0.0536 (0.0809)
rel_status	-0.108 (0.0881)	0.0222 (0.147)	-0.389*** (0.0729)	-0.407*** (0.0727)	-0.411*** (0.0731)	-0.400*** (0.0725)
isced97educ	0.0946*** (0.0328)	0.0859** (0.0348)	0.0879** (0.0342)	0.0198 (0.0321)	0.0846*** (0.0251)	0.0218 (0.0322)
SN_contact	-0.0548 (0.0547)	-0.0514 (0.0547)	-0.0524 (0.0499)	0.0129 (0.0540)	0.00591 (0.0539)	0.0108 (0.0541)
SN_proximity	0.000395 (0.0281)	-0.0224 (0.0332)	-0.0192 (0.0254)	0.0705*** (0.0253)	-0.0265 (0.0299)	0.0713*** (0.0252)
SN_closeness	0.0417 (0.0658)	0.0188 (0.0655)	0.0227 (0.0507)	0.0681 (0.0504)	0.0145 (0.0628)	0.0174 (0.0629)
child_SN	0.0283 (0.0361)	0.0261 (0.0351)	0.00246 (0.0302)	0.00780 (0.0302)	0.00778 (0.0302)	0.00825 (0.0348)
sibling_SN	0.0471 (0.0619)	0.0380 (0.0621)	0.00565 (0.0532)	0.0372 (0.0529)	0.0356 (0.0524)	0.0112 (0.0528)
parents_SN	-0.0735 (0.0926)	-0.0646 (0.0887)	-0.0126 (0.0897)	-0.00404 (0.0875)	0.00138 (0.0873)	-0.00346 (0.0660)
friends_SN	0.0739* (0.0383)	0.0736* (0.0379)	0.0745** (0.0320)	0.0731* (0.0320)	-0.0190 (0.0372)	-0.0290 (0.0374)
others_SN	0.0828 (0.0576)	0.0672 (0.0594)	0.0210 (0.0591)	0.0657 (0.0571)	0.0646 (0.0530)	0.0665 (0.0530)

M2: second stages

2/3

VARIABLES	(1) Probit reduced_hours	(2) IV Probit reduced_hours	(3) IV Probit reduced_hours	(4) IV Probit reduced_hours	(5) IV Probit reduced_hours	(6) IV Probit reduced_hours
log_inc_pre_ca	0.178*** (0.0526)	0.148** (0.0607)	0.154*** (0.0310)	0.145*** (0.0522)	0.0444 (0.0541)	0.145*** (0.0307)
job_flex_ca	0.166** (0.0734)	0.117 (0.0880)	0.103* (0.0874)	0.114** (0.0574)	0.108 (0.0770)	0.111* (0.0578)
ends_meet_ca	0.0337 (0.0495)	0.0970 (0.0693)	0.0890 (0.0708)	-0.202*** (0.0536)	-0.217*** (0.0411)	0.0989* (0.0409)
diagnosed_ca	-0.130 (0.145)	-0.258 (0.171)	-0.242 (0.144)	0.416*** (0.139)	-0.280* (0.152)	0.416*** (0.150)
ca_symptoms	-0.393* (0.227)	-0.416** (0.210)	-0.415* (0.184)	-0.419** (0.184)	0.135 (0.185)	-0.418** (0.209)
longterm_condition	-0.0503 (0.0748)	-0.0476 (0.0720)	-0.0482 (0.0596)	0.0298 (0.0595)	0.00952 (0.0598)	-0.0454 (0.0713)
health	-0.108** (0.0423)	-0.160*** (0.0538)	0.200*** (0.0559)	0.207*** (0.0331)	-0.164*** (0.0441)	-0.162*** (0.0438)
pain	0.183** (0.0762)	0.106 (0.107)	0.118 (0.106)	0.0952 (0.0839)	0.192*** (0.0618)	0.0989 (0.0841)
bmi_cat	0.0221 (0.0442)	0.0447 (0.0461)	-0.0704** (0.0470)	-0.0678* (0.0430)	-0.0748** (0.0430)	0.0468 (0.0432)
flu_vax	0.0534 (0.0815)	0.0172 (0.0854)	0.0224 (0.0861)	0.0879 (0.0802)	0.102 (0.0808)	0.0859 (0.0680)
iadl_score	0.0150 (0.0570)	-0.000689 (0.0536)	0.0519 (0.0545)	-0.00183 (0.0509)	0.0502 (0.0462)	0.0532 (0.0512)
smoker	-0.0357 (0.0900)	-0.0237 (0.0849)	-0.0205 (0.0861)	-0.0320 (0.0841)	-0.0276 (0.0690)	-0.0316 (0.0845)

M2: second stages

3/3

VARIABLES	(1) Probit reduced_hours	(2) IV Probit reduced_hours	(3) IV Probit reduced_hours	(4) IV Probit reduced_hours	(5) IV Probit reduced_hours	(6) IV Probit reduced_hours
alcohol	-0.180 (0.139)	-0.159 (0.135)	-0.164 (0.0931)	-0.155 (0.0935)	-0.151 (0.130)	-0.00788 (0.0935)
sport	-0.170 (0.169)	-0.155 (0.168)	-0.158 (0.169)	-0.141 (0.144)	0.0708 (0.170)	-0.142 (0.144)
Constant	-1.646*** (0.633)	-1.768*** (0.595)	-0.403 (0.605)	-1.772*** (0.567)	0.743 (0.495)	-0.412 (0.592)
Observations	2,296	2,296	2,296	2,296	2,296	2,296
First Stage Instruments:						
upto_month_avg_SI		X	X	X		X
upto_month_avg_newcasesperm			X		X	X
covid_death				X	X	X
Degrees of overidentification	0	1	1	1		2
Amemiya-Lee-Newey χ^2 stat		0.216	0.019	0.228	0.357	
Prob > χ^2		0.6424	0.8898	0.6327	0.8364	

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6.4: Estimation Results for increased_hours.

M2: first stages

1/4

VARIABLES	(1) OLS mh_ca	(2) OLS mh_ca	(3) OLS mh_ca	(4) OLS mh_ca	(5) OLS mh_ca
age	-0.00610 (0.00500)	-0.00737 (0.00500)	-0.00556 (0.00501)	-0.00826* (0.00499)	-0.00651 (0.00500)
female	0.286*** (0.0567)	0.284*** (0.0565)	0.281*** (0.0566)	0.260*** (0.0561)	0.279*** (0.0565)
rel_status	-0.398*** (0.0735)	-0.388*** (0.0733)	-0.407*** (0.0732)	-0.410*** (0.0735)	-0.399*** (0.0729)
isced97educ	0.0152 (0.0254)	0.0184 (0.0255)	0.0198 (0.0251)	0.0106 (0.0253)	0.0222 (0.0253)
SN_contact	0.0100 (0.0503)	0.00656 (0.0502)	0.0130 (0.0503)	0.00550 (0.0502)	0.0104 (0.0502)
SN_proximity	0.0761*** (0.0256)	0.0774*** (0.0255)	0.0705*** (0.0254)	0.0675*** (0.0254)	0.0716*** (0.0254)
SN_closeness	0.0697 (0.0511)	0.0680 (0.0510)	0.0681 (0.0508)	0.0631 (0.0510)	0.0669 (0.0507)
child_SN	0.00170 (0.0303)	0.00251 (0.0304)	0.00777 (0.0304)	0.00786 (0.0304)	0.00827 (0.0304)
sibling_SN	0.00850 (0.0537)	0.00554 (0.0535)	0.0130 (0.0533)	0.0249 (0.0527)	0.0108 (0.0531)
parents_SN	-0.0136 (0.0666)	-0.0125 (0.0667)	-0.00413 (0.0663)	0.00154 (0.0665)	-0.00347 (0.0664)

M2: first stages

2/4

VARIABLES	(1) OLS mh_ca	(2) OLS mh_ca	(3) OLS mh_ca	(4) OLS mh_ca	(5) OLS mh_ca
friends_SN	-0.0258 (0.0322)	-0.0264 (0.0322)	-0.0286 (0.0322)	-0.0189 (0.0321)	-0.0290 (0.0322)
others_SN	0.0227 (0.0539)	0.0210 (0.0538)	0.0208 (0.0534)	0.0284 (0.0533)	0.0196 (0.0533)
log_inc_pre_ca	0.0382 (0.0314)	0.0287 (0.0312)	0.0290 (0.0309)	0.0437 (0.0312)	0.0222 (0.0308)
job_flex_ca	0.108* (0.0582)	0.103* (0.0586)	0.114** (0.0578)	0.129** (0.0580)	0.110* (0.0581)
ends_meet_ca	-0.197*** (0.0415)	-0.202*** (0.0417)	-0.202*** (0.0409)	-0.218*** (0.0414)	-0.205*** (0.0411)
diagnosed_ca	0.443*** (0.145)	0.443*** (0.145)	0.416*** (0.139)	0.421*** (0.140)	0.416*** (0.140)
ca_symptoms	0.162 (0.185)	0.154 (0.185)	0.121 (0.185)	0.134 (0.186)	0.116 (0.184)
longterm_condition	0.0247 (0.0601)	0.0269 (0.0600)	0.0299 (0.0599)	0.00950 (0.0602)	0.0314 (0.0599)
health	0.202*** (0.0336)	0.199*** (0.0336)	0.207*** (0.0334)	0.198*** (0.0332)	0.205*** (0.0333)
pain	0.192*** (0.0624)	0.190*** (0.0623)	0.177*** (0.0620)	0.192*** (0.0622)	0.176*** (0.0620)

M2: first stages

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VARIABLES	(1) OLS mh_ca	(2) OLS mh_ca	(3) OLS mh_ca	(4) OLS mh_ca	(5) OLS mh_ca
bmi_cat	-0.0724** (0.0355)	-0.0703** (0.0354)	-0.0678* (0.0352)	-0.0747** (0.0355)	-0.0663* (0.0352)
flu_vax	0.0932 (0.0688)	0.0900 (0.0686)	0.0879 (0.0685)	0.102 (0.0689)	0.0856 (0.0684)
iadl_score	0.0539 (0.0463)	0.0517 (0.0465)	0.0546 (0.0463)	0.0500 (0.0465)	0.0530 (0.0465)
smoker	-0.0209 (0.0702)	-0.0205 (0.0702)	-0.0319 (0.0692)	-0.0383 (0.0695)	-0.0314 (0.0693)
alcohol	-0.0127 (0.0935)	-0.0111 (0.0936)	-0.00873 (0.0941)	-0.0246 (0.0946)	-0.00767 (0.0941)
sport	0.0347 (0.152)	0.0369 (0.152)	0.111 (0.145)	0.0706 (0.145)	0.112 (0.145)
upto_month_avg_SI	0.0218*** (0.00560)	0.0243*** (0.00601)	0.0212*** (0.00556)		0.0230*** (0.00594)
upto_month_avg_newcasesperm		0.00405 (0.00293)		-0.000674 (0.00273)	0.00297 (0.00290)
covid_death			0.233*** (0.0481)	0.238*** (0.0496)	0.230*** (0.0479)

M2: first stages

4/4

	(1) OLS mh_ca	(2) OLS mh_ca	(3) OLS mh_ca	(4) OLS mh_ca	(5) OLS mh_ca
VARIABLES					
Constant	-0.386 (0.580)	-0.394 (0.581)	-0.413 (0.578)	0.755 (0.498)	-0.419 (0.579)
Observations	2,296	2,296	2,296	2,296	2,296
F(m, n-(k+1))	15.14	8.19	19.83	11.55	13.49
Prob >F	0.0001	0.0003	0	0	0
R-squared	0.124	0.124	0.134	0.128	0.134

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6.5: First Stage Estimation Results for increased_hours.