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The impact of stay-at-home policies on individual welfare*

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Abstract

In this paper, we perform a choice experiment assessing the impact of stay-at-home policies on individual welfare. We estimate the willingness to accept compensation (WTA) for restricting non-working hours in Sweden during the COVID-19 pandemic. The WTA for a one-month stay-at-home policy is about US$480 per person, or 9.1 percent of Sweden's monthly per capita GDP. Stricter lockdowns require disproportionately higher compensation than more lenient ones, indicating that strict policies are cost-effective only if they are much more successful in slowing the spread of the disease. Moreover, older people have a higher WTA of staying home than the rest of the population.

Keywords: Choice experiment; individual welfare effects; mental distress; stay-at-home orders
JEL classification: *D*62; *I*18

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1. Introduction

Countries around the world have enforced stay-at-home policies to deal with the COVID-19 outbreaks. As governments ponder over how to design restrictions to deal with current and future outbreaks, understanding the costs and benefits of non-pharmaceutical interventions such as stay-at-home orders is essential for policymaking. Theoretical models and cost–benefit analyses shed light on the potential tension between reducing mortality and stabilizing economic activity (Acemoglu et al., 2020; Thunström et al., 2020; Alvarez et al., 2021; Eichenbaum et al., 2021). Yet, it is clear that comprehensive policy evaluations have to look beyond the direct effects on mortality and the economy (Layard et al., 2020).

Stay-at-home policies bring a range of both direct and indirect welfare effects on individuals. One key type of costs stems from the anxiety and desolation of individuals who become required to isolate themselves. These costs could take many forms, including mental distress (Pfefferbaum and North, 2020; Twenge and Joiner, 2020; Giuntella et al., 2021), which at the very extreme may lead to increased rates of suicide and domestic violence (Cao et al., 2020; Holmes et al., 2020; Taub, 2020). Additionally, stay-at-home orders also rule out social activities that naturally bring welfare.[1] All these non-monetary costs are difficult to quantify using observational data. Hence, despite the importance of understanding the individual welfare effects of stay-at-home policies, little is known about their magnitude.

In this paper, we use a choice experiment to estimate the individual welfare effects of stay-at-home policies that limit people's opportunities to leave their homes during non-working hours. Specifically, we estimate the compensating variation, which is the amount of money needed to compensate an individual for the utility loss of a policy change – this is a common measure of individual welfare change (e.g., Mas-Colell et al., 1995; Just et al., 2005). In the following, we also refer to the compensating variation as the change in "individual welfare". Choice experiments are routinely applied to estimate the compensating (equivalent) variation of policies (e.g., Layton and Brown, 2000; Benjamin et al., 2014; Cropper et al., 2014; Blackman et al., 2018; Fischer et al., 2018; Elías et al., 2019). The method is particularly well suited for our context, as it allows us to obtain encompassing estimates of the individual welfare effects of physical isolation for a broad sample.[2] Such estimates would be hard to obtain using

[1]The value of social activities figures prominently as the core motivation of individual behavior in equilibrium models of pandemic disease control (Farboodi et al., 2021).
[2]We focus on the individual "costs" of stay-at-home policies that come from physical isolation. We do not provide estimate of the benefits of stay-at-home policies such as, for example, protecting the health-care system from becoming overwhelmed.

observational data as we cannot directly observe individual welfare, and it is hard to think of a suitable way to measure welfare indirectly using such data.

The choice experiment was administered as an online survey to a general population sample of adult Swedes – representative in terms of age, gender, and geography – during mid-April 2020 ($N = 1{,}495$). In our design, respondents are presented with a series of possible program versions, each describing a specific stay-at-home policy, and then asked whether they would like to participate in it or not. In each program version, we vary the length of the stay-at-home policy and the number of non-working hours people would be allowed to leave their homes. Program participation is voluntary, and each version is coupled with a compensation that would be paid if the respondent opts in. Using this method, we can obtain an estimate of the individual welfare effect of having to stay home – that is, the willingness to accept compensation (WTA) – for each of the different dimensions.[3]

We find that stricter and longer stay-at-home policies are disproportionately more costly than more lenient ones. The WTA for isolation for two weeks but being allowed to leave home for 14 hours per week is only $30 per week (throughout the paper, "$" refers to US dollars), while the WTA for isolation for six weeks and only being allowed to leave home for two hours per week is $228 per week. This indicates that strict stay-at-home policies are likely to be cost-effective only if they slow the spread of the disease much more than more lenient policies.

Our results also shed light on sociodemographic and health-behavioral differences in the individual welfare impact of stay-at-home policies. Pandemic policies often target specific at-risk groups in society, such as older people. Indeed, recent theoretical results on optimal policy responses to the pandemic prescribe stricter policies for older individuals (Acemoglu et al., 2020). To assess the cost-effectiveness of such directed policies, it is essential to understand the heterogeneity in WTA. We find that people over the age of 60 have a much higher WTA of staying home than the rest of the population, even after accounting for socioeconomic characteristics (including income) and social distancing behaviors. These observed age differences in WTA should be considered when discussing policies targeting the elderly. We also find that people who already engage in social distancing

[3]The stay-at-home policy restricts people's use of time, and our study thus relates to the literature on the optimal allocation and value of time, originating from the work by Becker (1965). The empirical literature is vast, ranging from measuring time use (e.g., Aguiar and Hurst, 2007; Ramey and Francis, 2009) and estimating the demand for leisure (e.g., Phlips, 1978; Barnett, 1979) to estimating the value of time using surveys or experiments (e.g., Deacon and Sonstelie, 1985; Smith and Mansfield, 1998).

behaviors require a lower compensation to stay at home, indicating that social distancing and the WTA of staying home are complements rather than substitutes.

Our results suggest that the welfare impact of stay-at-home orders is considerable. For example, assume that a one-month stay-at-home policy allowing only eight non-working hours spent away from home is adopted universally across Sweden. Our estimates then suggest that it would require payments of $3,800 million per week to compensate all Swedes for the policy. This is equivalent to 9.1 percent of Sweden's monthly GDP, or 0.8 percent of the annual GDP. This figure can also be interpreted as 29,600 quality-adjusted life years (QALYs), which roughly corresponds to between 3,700 and 8,000 COVID-19 fatalities. Importantly, we only consider effects associated with restricting people's non-working hours. Hence, to obtain the societal cost of more restrictive stay-at-home orders, our estimate should be added to the costs of shutting down workplaces, schools, and childcare facilities, and the corresponding reduction in economic activity.

We collected the experimental data in a context in which there was little information about the virus, when most developed countries had just imposed strict stay-at-home policies, and there was, in general, little experience with living in a pandemic. To study whether our results depend on this particular context, we replicated our study with a new sample in December 2020 (N = 744). Despite the context being rather different – participants had experienced the pandemic for almost a year and government restrictions were much stricter than in April – our results remain strikingly similar.

This paper is organized as follows. In Section 2, we present the choice experiment and the survey design. In Section 3, we describe the econometric specification. In Section 4, we present the results. We conclude in Section 5 and discuss the policy relevance and implications of our results.

2. Survey and experimental design

In this section, we first introduce the design of the choice experiment and then describe the full set-up of the survey and the characteristics of our sample.

2.1. Choice experiment

We presented a situation where the government had designed a voluntary stay-at-home program to reduce the spread of the COVID-19 virus.[4] As we

[4]Asking participants to volunteer allows us to estimate the individual WTA. A potential limitation of this approach is that people might react differently if the stay-at-home policy is exogenously

wanted to focus on non-work time, we informed the subjects that schools would remain open and that people would still be able to work (from home or at their workplace).[5] We explained that in order for the program to be successful, 30 percent of the households would have to participate.[6] Furthermore, we explained that this level of participation was required for different types of households, including households with the same age and location profile as the respondent. Because of uncertainties regarding how such a program should be designed, respondents were told that three aspects would be varied:

1. number of weeks (two, four, or six);
2. number of hours away from home allowed for each household member (two, eight, or fourteen hours per week);
3. compensation to each adult participating ($0, $50, $100, $150, $200, or $250 per week).[7]

The number of weeks captures the main aspect of any stay-at-home program (i.e., the length of time households would have to isolate). The number of weeks that countries have been under stay-at-home orders, or pandemic lockdowns, has varied greatly, although most countries have had such policies in place for at least one month. The number of hours people are allowed to be away from home reflects how much flexibility there is for household members to go shopping or engage in leisure activities. This has also varied between countries and parts of countries, and not all policies have specified an exact amount of time that people are allowed to spend away from home, although, for example, France set a restriction

imposed (Dal Bó et al., 2010). In the latter case, the individual welfare effects are likely to be larger than what we find, given that individuals might suffer additional utility losses from loss of controllability. We thank an anonymous referee for pointing this out.

[5]Focusing on non-work time gives us more control over participants' beliefs and potential motives. Restricting individuals to work only from home would only be feasible for some individuals. Limiting the possibilities to work would also raise a number of questions related to job security and permanent job loss, issues that are important but not our main focus. Moreover, by focusing on non-work time, participants do not have to worry about their decisions having an impact on the functioning of essential sectors in the economy, such as health care.

[6]Since participants were asked to participate voluntarily, we chose 30 percent to make the scenarios credible. For example, we would expect few participants to believe that 70 percent of the population would participate in a program that forces them to stay at home for six weeks without compensation, or that (as in one of the survey versions) restaurants and shops would remain open if 70 percent of the population stayed at home.

[7]We implemented the choice experiment with Swedish crowns (1 SEK = $0.10). For an easier interpretation of our results, we express all magnitudes in US dollars rather than in Swedish crowns.

of a maximum of one hour per day. We explained that the payment was made as a way of recognizing that it would be costly for households to isolate. It was explained that the program would be voluntary, but anyone participating would have to follow the provided rules for the stipulated time.

To understand whether the individual welfare impact of stay-at-home orders depends on the outside options, we implemented two survey versions to which each participant was randomly assigned. In one version, respondents were informed that restaurants and stores would be open, but that public gatherings would be limited to a maximum of 50 people. The description was similar to the actual situation in Sweden at the time of the experiment. In the other version, the situation would be stricter, with closed restaurants and stores and only pharmacies and supermarkets allowed to be open.

The respondents were asked to state whether their household would participate in each of nine versions of a voluntary stay-at-home program. The nine presented program designs differed along the dimensions described above.[8] Before they made their choice, an example choice scenario was presented. In order to reduce demand effects, we also explained that there was no right or wrong answer. Online Appendix C contains a complete description of the choice experiment scenario.

2.2. The survey

The choice experiment was the central module of a survey that consisted of four parts. In the first part, we asked the respondents about their behavior during the ongoing COVID-19 pandemic.[9] The second part contained the choice experiment. The third part included a set of questions relating to the current Swedish policy. We asked to what extent participants worried about the economy, at both the private and the societal level, the functioning of the health-care sector, to what extent they thought the government did enough to

[8]The nine potential program scenarios were generated with an orthogonal design using Ngene (ChoiceMetrics, 2018), allowing us to estimate independent non-linear effects for all aspects. The total number of choice scenarios from the orthogonal design is 18. In the survey, each respondent was asked to consider nine scenarios randomly drawn from the total set of 18.

[9]The questions measured, for example, whether respondents avoided social contacts, kept their distance from other people, and refrained from traveling, as well as whether they stayed informed about the pandemic and maintained personal hygiene routines, such as sneezing into their elbow and not touching their face. It was important to ask the questions about behavior before the choice experiment as the two survey versions might affect statements about behavior during the pandemic. We believe such spillovers to be less relevant for the socioeconomic variables, which we asked about after the choice experiment.

fight the pandemic, and their beliefs about the risk of becoming infected.[10] Finally, in the fourth part, we asked the respondents questions about their socioeconomic status, such as age, education, gender, and housing. The questions are given in Online Appendix C.

2.3. Sample

The respondents were recruited from a general population panel in Sweden. The panel is representative with respect to age, gender, and geographic composition of the adult (+18 years old) Swedish population. The sampling was stratified by gender, age, and geographic composition, and the online survey was sent by the survey company Enkätfabriken during the period 8–30 April 2020. We obtained 1,845 responses, of which 215 were incomplete and therefore excluded. In addition, we excluded 135 respondents who completed the survey in less than five minutes. We expect this to be the minimum amount of time a person needs to fill out the survey with sufficient focus. This leaves us with a sample size of 1,495. Descriptive statistics of the sample are presented in Table A1 in the Appendix. In comparison with the Swedish population, our sample is indeed representative with respect to gender, age composition, and geographic location of households. However, we have an over-representation of university-educated people (37 percent) compared with the population (23 percent). For this reason, all estimates are based on sampling weights where we correct for this misrepresentation.[11]

2.4. The Swedish context in April 2020

In April 2020, the Swedish average daily number of new intensive care (ICU) admissions was 35, and the average daily number of deaths related to COVID-19 was 87, suggesting similar numbers of COVID-19 cases per capita as countries such as the US and the UK. However, unlike most other countries, Sweden avoided mandating strict stay-at-home policies. Restaurants, shopping malls, and gyms remained open during the first peak of the pandemic. Most people did not self-isolate. Our participants report that last week they left their home on average 1.5 times to do physical activities with other people, 1.8 times to spend time with friends and relatives who do not live in the same household, and 2.3 times to buy

[10]We also elicited their risk, time, and social preferences, using the questions from Falk et al. (2018). These questions were elicited for another research project unrelated to the choice experiment (Campos-Mercade et al., 2021).

[11]All results reported in the paper are very similar if we do not use sampling weights. The unweighted estimations are presented in Online Appendix A.

things other than food and medicine (e.g., clothes). While they interacted less with others than the previous year (the corresponding reported numbers for the previous year are 3.7, 3.1, and 3.3 times, respectively), there was still a considerable amount of mobility. Hence, the proposed stay-at-home policy goes beyond private mitigation efforts.

3. Econometric framework

In the choice experiment, we observe the choice of participating or not for each suggested design of the program. We apply a random utility model framework to analyze the data (McFadden, 1974). In program version i, the program is described with an attribute vector a_i and a compensation c_i. Given an income of M_k, the utility of not participating and participating is expressed as

$$V_{jk}(\text{not participating}) = U(M_k) = \alpha + \gamma M_k + \varepsilon_{jk}, \quad (1)$$

$$V_{ik}(\text{participating}) = U(a_i, M_k, c_i) = \beta a_i + \gamma(M_k + c_i) + \varepsilon_{ik}, \quad (2)$$

where ε_{ik} is an error term capturing, by the researcher, unobserved effects, β is a parameter vector, α is an alternative-specific constant for non-participation, and γ is the marginal utility of money.[12] The probability that individual k chooses to participate in program version i can now be expressed as

$$\begin{aligned} P_{ik} &= P\left[\beta a_i + \gamma(M_k + c_i) + \varepsilon_{ik} > \alpha + \gamma M_k + \varepsilon_{jk}\right] \\ &= P[\beta a_i + \gamma c_i - \alpha > \eta_{ik}], \end{aligned} \quad (3)$$

where $\eta_{ik} = \varepsilon_{jk} - \varepsilon_{ik}$. Thus, the probability of participation depends on the difference in utility between the two alternatives and the error term. To estimate this model, we assume that η_{ik} has a standard normal distribution, which means that we estimate a probit model. Moreover, we allow for non-linear effects for both non-monetary attributes through a dummy coding of the attribute levels, using the least restrictive scenario as the reference case (i.e., two weeks at home with 14 hours per week allowed away from home). From estimated model parameters, we can estimate the compensating variation of a particular policy, that is, the individual welfare effect of

[12]We assume that the marginal utility of money (income) is constant and the same for all individuals. This is common in the literature, but it is possible to estimate other functional forms of the utility function (Hensher et al., 2005). We have estimated a model where we allow for the marginal utility of money to vary with the income level of the individual using a piecewise linear spline function of income with three different groups. The core results in terms of average WTA are robust to this specification, and, as expected, we find that the marginal utility of money is lower for higher-income individuals. This would, in turn, result in higher WTA estimates for higher-income individuals. Full results are available upon request from the authors.

a restriction on the behavior of the individual (Mas-Colell et al., 1995; Just et al., 2005). This measure is expressed in terms of how much income would have to change in order to keep the individual at the initial utility level with no restrictions, given that the policy has taken place. We measure the compensating variation using the WTA. The WTA for any combination (a_m) of the attribute levels is (Holmes et al., 2017)

$$WTA(a_m) = \frac{\alpha + \beta_m}{\gamma}. \quad (4)$$

Additionally, we can use the model's parameters to estimate the predicted probability of participation for different configurations of the program.

4. Results

In this section, we begin by presenting our core estimates of the WTA of stay-at-home policies. Thereafter, we explore the heterogeneity of these estimates with respect to socioeconomic background variables, including characteristics of the respondents' home and work arrangements. Finally, we present the results of a replication study carried out around eight months after the initial study.

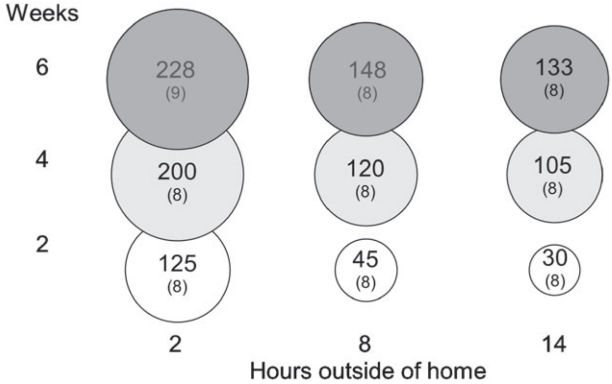
4.1. Willingness to accept compensation of stay-at-home policies

We find no differences between the two survey versions of the experiment (open/closed restaurants and stores).[13] In the following, we combine the responses from the two versions and estimate a pooled model. Standard errors are clustered at the individual level. The estimated binary probit model is presented in Table A2 in the Appendix. In Figure 1, we display the estimated WTA measures for different stay-at-home policies. Note that these measures include the overall disutility/utility (measured in monetary terms) of participating in the program, as indicated by the sign and magnitude of the intercept in the probit model.

The WTA for a short period of social isolation (two weeks) for households is modest when the number of hours allowed away from home is relatively generous (14 hours). When the number of hours is more restricted,

[13] In Table A2, we have estimated a probit model on the pooled data with interaction terms between the non-monetary attributes and a dummy variable capturing survey version. The corresponding WTA estimations are in Table A3. The WTA estimates of the two survey versions are very similar. The only notable differences between the survey versions are observed for the two-week scenarios with eight or 14 hours allowed away from home. One potential explanation is that the scenario differences become less salient when the stay-at-home policies become stricter (cf. Kőszegi and Szeidl, 2013).

Figure 1. WTA for stay-at-home policy in US dollars per week



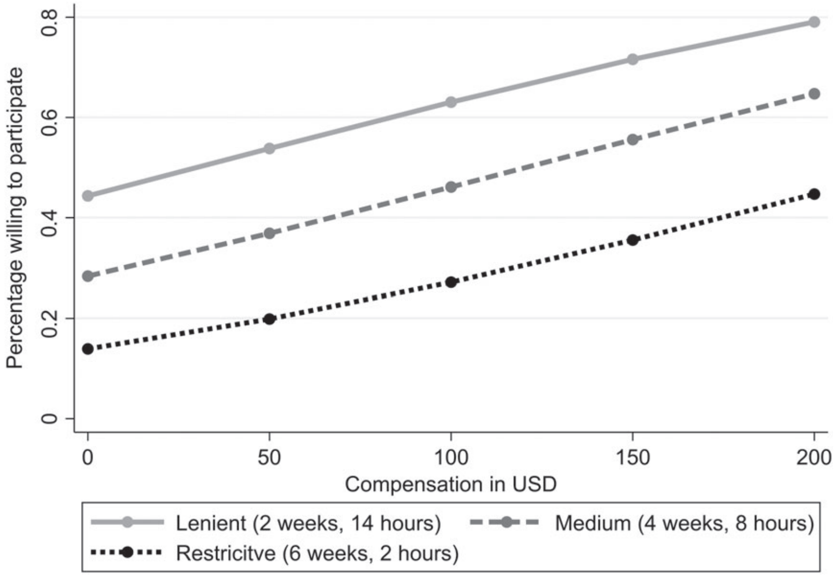
Notes: Estimated mean WTA in US dollars per week and per adult for a household to participate in the program. To obtain the total compensation required for participating in a program, the numbers given in the figure should be multiplied by the number of weeks. Standard errors obtained by the delta method are given in parentheses.

the estimated WTA increases substantially; if set to only two hours per week, the estimated mean WTA is $125 per adult and per week. Similarly, increasing the length of social isolation from two to four weeks increases the mean WTA to $105, even when participants are allowed to be away from home for 14 hours per week. Moving from four to six weeks also results in an increase in WTA, although it is smaller than moving from two to four weeks. As for the number of hours allowed away from home, the rise in WTA when moving from eight to two hours is substantial, while moving from 14 to eight hours results in a smaller increase. This is consistent with standard utility theory and the diminishing marginal utility of leisure.

Another informative way of illustrating the results is to look at predicted participation probabilities for different compensation levels and program versions. In Figure 2, we report predicted participation probabilities for three versions of the program: a lenient version, with two weeks of isolation and 14 hours per week allowed away from home; a medium version, with four weeks of isolation and eight hours per week allowed away from home; and a strict version, with six weeks of isolation and two hours per week allowed away from home.

Several observations can be made from the predicted program participation probabilities. To begin with, a sizeable fraction of the respondents would be willing to participate even without any compensation. For the most lenient program, this fraction is about 44 percent. For the most restrictive program, the share drops to nearly 14 percent. Consequently, if voluntary self-isolation were implemented for a limited period, a sizeable

Figure 2. Predicted participation probabilities by level of compensation



share of the population would opt into this, and the direct welfare consequences for these households would be modest. At the same time, even for a lenient program, a rather sizeable compensation of $200 would not reach an 80 percent participation rate. For the most restrictive program, this fraction goes down to 45 percent. This indicates that self-isolation would result in large negative individual welfare consequences for a large part of the population.

4.2. Heterogeneities in WTA

To explore heterogeneities in the estimated WTA, in this subsection we investigate to what extent the willingness to participate in the voluntary program and the WTA of social isolation vary with individual characteristics. In Table 1, we present estimates from three models. In the first model, we include a number of sociodemographic characteristics. In the second, we add a set of work and home characteristics that might affect the willingness to participate in the stay-at-home program. In the third model, we aggregate 13 pandemic health and social distancing behaviors that we queried in relation to how participants behave in their everyday life. These behaviors included questions such as to what extent they try to avoid physical social contacts, keep social distance, and

Table 1. Marginal effects: pooled probit models with heterogeneous effects

	(1)	(2)	(3)
Female	0.044**	0.040*	0.009
	(0.021)	(0.021)	(0.021)
Aged 39–39 years	−0.045	−0.044	−0.056
	(0.035)	(0.035)	(0.035)
Aged 40–49 years	−0.023	−0.021	−0.065*
	(0.036)	(0.036)	(0.035)
Aged 50–59 years	−0.041	−0.042	−0.087***
	(0.033)	(0.033)	(0.034)
Aged 60–69 years	−0.093**	−0.094**	−0.153***
	(0.037)	(0.037)	(0.038)
Aged ≥70 years	−0.161***	−0.159***	−0.219***
	(0.042)	(0.043)	(0.044)
Income per adult	−0.016	−0.015	−0.016
	(0.011)	(0.011)	(0.011)
Employed	−0.064**	−0.065**	−0.060**
	(0.025)	(0.025)	(0.025)
University education	0.084***	0.089***	0.088***
	(0.021)	(0.021)	(0.021)
One adult in household	0.068***	0.084***	0.086***
	(0.024)	(0.027)	(0.026)
No children in household	0.027	0.037	0.025
	(0.024)	(0.026)	(0.025)
Big city (>300,000 inhabitants)	−0.010	−0.008	−0.010
	(0.027)	(0.029)	(0.029)
City (<300,000 and >50,000 inhabitants)	−0.041	−0.040	−0.034
	(0.029)	(0.030)	(0.030)
Small city (<50,000 inhabitants)	0.005	0.003	0.006
	(0.033)	(0.033)	(0.033)
Cannot work from home		−0.004	0.002
		(0.028)	(0.027)
House		−0.049*	−0.052*
		(0.029)	(0.029)
House/apartment size		−0.001	−0.000
		(0.000)	(0.000)
Have access to garden		0.086***	0.085***
		(0.028)	(0.027)
Have access to balcony		0.020	0.011
		(0.024)	(0.024)
Good health behavior			0.085***
			(0.013)
Probability of becoming infected			0.083**
			(0.037)

Table 1. Continued

	(1)	(2)	(3)
Compensation in $100	0.193***	0.194***	0.198***
	(0.008)	(0.008)	(0.008)
Choice experiment attributes	Included	Included	Included
Observations	13,455	13,455	13,455

Notes: Models estimated with sampling weights to adjust for over-representation of university-educated respondents. Marginal effects estimated by keeping all other variables at their means. Choice experiment attributes include dummies for each of the categories of the choice experiment, namely weeks and hours away from home. Robust standard errors are given in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

wash their hands. We aggregate these 13 health behaviors by performing a principal-component factor analysis. We selected the factor with the highest eigenvalue (eigenvalue = 4.50) as our measure of (compliant) health behavior (Table A4 presents a list with all the questions and their corresponding factor loadings). We also include individuals' beliefs about the risk of becoming infected with COVID-19.

There are a number of demographic and socioeconomic characteristics that affect the likelihood of participation. To begin with, individuals over the age of 60 are considerably less likely to participate. A respondent belonging to the oldest category (70 years and older) has a participation probability that is around 23 percentage points lower than a respondent in the youngest group (in model 2). This marginal effect corresponds to a difference in WTA for participating at all of $118 per week.[14] Women, as well as university-educated and single-adult households, are more likely to voluntarily participate, which means that the WTA of a stay-at-home program is lower for these groups. In contrast, having a job is negatively associated with participation. Households in larger cities are no different from households in rural areas when it comes to the likelihood of participating.

In model 2, when including work and home characteristics that potentially affect the individual welfare effects of the policy, the magnitudes of the coefficients are similar to those in model 1. We find that respondents with access to a garden are more likely to participate.[15] Whether or not the respondent can work from home does not have an impact on the willingness to participate.

[14]Marginal effects on WTA are estimated as ratios between the coefficient in question and the compensation coefficient.

[15]Interestingly, those relatively few who live in a house but do not have access to a garden are less willing to participate than those who live in an apartment. However, we interpret this finding cautiously, as it is only marginally significant and we do not replicate it in December 2020 (see Table A5 in the Appendix).

In model 3, we observe that people who report more compliant health and social distancing behavior throughout the pandemic are significantly more willing to participate. One interpretation of this finding is that those who already engage in social distancing find it less costly to restrict their movements and social contacts further. We also find that individuals who believe in a higher risk of becoming infected have a lower WTA to participate. This suggests that the individual welfare effect of stay-at-home policies could depend on the perceived infection risk.[16] In this model, the effect for women vanishes. Interestingly, the estimates for older respondents become, if anything, more negative. This indicates that the reason why older people have a higher WTA to participate in the program is not that they behave differently during the pandemic or have different perceptions of the risk of being infected.

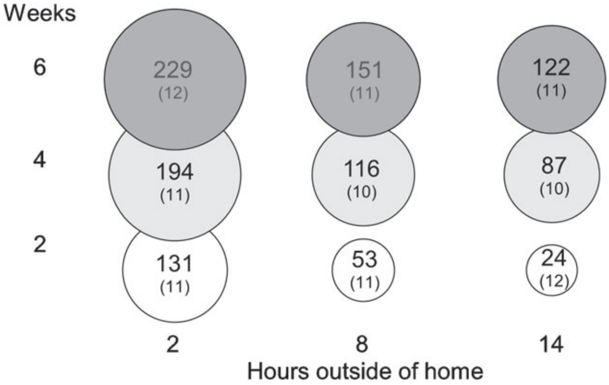
4.3. Replication in December 2020

We conducted the survey in April 2020, during a time when there was much uncertainty about the virus and, in general, there was little experience with living in a pandemic. To study whether our results depend on this particular context, we administered our choice experiment again eight months later, in December 2020, as part of an independent research project (Andersson et al., 2021). We followed the same procedure as in April,[17] but recruited a new set of 744 subjects and only used the survey version in which the economy remains open (recall that we found no differences between both survey versions).

There were clear similarities in the pandemic development during the two data collections as they were conducted around the peaks of the first and second waves. Indeed, Sweden was experiencing similar numbers of new ICU admissions and daily fatalities in December as in April.[18] Yet, in terms of living conditions and experiences, the COVID-19 situation in December differs substantially from the situation in April: the governmental communication and restrictions in Sweden were much stricter in December (including restrictions on the number of people in indoor public spaces and upper-level school closures in several regions). In addition, people had

[16]The perceived infection risk affects willingness to stay at home in April but not in December (see Table A5 in the Appendix), suggesting a potential interaction between perceived risks and other time-dependent variables such as the government response and knowledge about the disease.
[17]As in the first sample, our second sample is largely representative (+18 years old) on observable characteristics (age, gender, and geography) of the Swedish population.
[18]During the time periods when the surveys were conducted, the average daily number of new ICU cases was 35 in April and 24 in December. The average daily number of deaths related to COVID-19 was 87 in April and 79 in December.

Figure 3. WTA for stay-at-home policy in US dollars per week, December 2020



Notes: Estimated mean WTA in US dollars per week and per adult for a household to participate in the program. To obtain the total compensation required for participating in a program, the numbers given in the figure should be multiplied by the number of weeks. Standard errors obtained by the delta method are given in parentheses.

access to more information about the disease and eight more months of pandemic experience.

Despite these differences, the replication in December yields strikingly similar results, as shown in Figure 3, which reproduces Figure 1 using the December 2020 data, and Table A5 in the Appendix, which corresponds to Table 1. For example, participants' WTA for staying at home for two weeks and being allowed two hours per week away from home was $125 in April and $131 in December. Similarly, participants' WTA for staying at home for six weeks and being allowed 14 hours per week away from home was $133 in April and $122 in December. None of the differences across Figures 1 and 3 is statistically significant. Similarly, the key heterogeneities shown in Table 1, such as the lower WTA for older participants and higher WTA for individuals already engaging in social distancing behavior, are all replicated in Table A5.[19] We conclude that people's willingness to stay at home is remarkably stable.

5. Discussion and conclusions

Most countries have enforced stay-at-home policies to deal with the COVID-19 outbreaks. As governments evaluate the use of such policies for current and future pandemic outbreaks, understanding their costs and benefits is essential for effective policymaking.

[19]The notable exception is that the perceived risk of becoming infected is no longer statistically significant.

While stay-at-home policies are likely to be useful in preventing the spread of a disease, our results suggest that they may come with substantial costs. By performing a choice experiment with a general population sample in Sweden, we estimate the individual welfare impact of different stay-at-home policies. For the average individual, the estimated WTA for a one-month stay-at-home policy allowing only eight non-working hours spent away from home each week is about $480. If universally implemented across Sweden, this amounts to $3,800 million, which corresponds to around 9.1 percent of Sweden's monthly GDP, or 0.8 percent of the annual GDP. This compensation corresponds to 29,600 QALYs, or roughly between 3,700 and 8,000 COVID-19 fatalities in Sweden.[20]

The above exercise gives the same weight to each individual when aggregating the individual WTA measures, which means that we do not take redistributive concerns into account. Although this is the common procedure in applied cost–benefit analysis (see, e.g., Boadway, 2006), this is not to say that distributional concerns should be ignored when evaluating the policy.[21] Hence, our aggregated measures should not necessarily be interpreted as the social welfare, but as simple estimates of how much money it would require to compensate all Swedes so that they would be indifferent to implementing different stay-at-home policies.

In practice, there are many ways to implement a stay-at-home policy, and our results also shed light on how people value different dimensions of the policy. First, people give great weight to the time that they are allowed to spend away from home. The weekly WTA of a one-month stay-at-home policy for an average citizen is about $105 if allowed to be away from home for 14 hours per week, and $200 if only allowed to be away from home for two hours per week. Second, and perhaps more importantly, the weekly WTA of stay-at-home policies increases sharply with the number of weeks that people are required to stay at home. The weekly WTA of a two-week stay-at-home policy for an average citizen is about $45, while that for a six-week policy is about $148. Taken together, we find that the WTA for stay-at-home policies is far from linear in the number of weeks, ranging from $30 per week (two weeks with 14 hours allowed away from home per week) to $228 per week (six weeks with two hours allowed away from home per week).

[20]The QALY calculation assumes a value of $128,000 per QALY, following the estimations in Sweden by Svensson and Nilsson (2016), and in line with the guidelines by Neuman et al. (2014). The calculations of COVID-19 fatalities are based on the quality-adjusted life expectancies in Briggs (2020). See Online Appendix B for a detailed explanation of the calculations.

[21]The standard argument for not using distributional weights would be that it is more efficient to focus on efficiency in cost–benefit analysis and to leave any distributional considerations to income taxation (see, e.g., Boadway and Keen, 1993). However, this argument has been questioned (see, e.g., Dreze, 1998; Johansson-Stenman, 2005).

These results indicate that stricter and longer lockdowns are disproportionately more costly than more lenient ones. Whether the benefits in terms of reduced spreading of the virus outweigh such costs is outside of the scope of this paper. However, our results highlight that strict stay-at-home policies are likely to be cost-effective only if the spread reduction is much higher than for more lenient policies.

Moreover, we document large heterogeneities in the individual WTA for staying at home. For the most lenient policy that we analyze, the WTA is close to zero for 44 percent of the individuals, while for 21 percent the WTA is higher than $200 per week. For the most restrictive policy, the WTA is close to zero for 14 percent and over $200 for 55 percent of the individuals. Notably, the WTA is related to health and social distancing behaviors during the pandemic. Those who already comply with health and social distancing recommendations also have a lower required compensation to restrict behavior further by participating in the program. We also find some evidence that the perceived infection risk affects the willingness to stay at home.

Finally, we also observe that age explains part of the heterogeneity in the WTA. Even after controlling for other socioeconomic characteristics and health and social distancing behaviors, older people have a higher WTA than the rest of the population. This result indicates that pandemic policies that target specific at-risk groups in society, such as older people, might have more nuanced implications for individual welfare than previously thought.

As in most policy evaluations, our estimates could be sensitive to the underlying context in which participants make their decisions. We describe a situation where people keep working, children go to school, and the proposed restrictions only apply to the non-working time of those who participate in the program. In reality, the context in which stay-at-home policies are applied differs by country and region, and people's willingness to stay at home might vary depending on the underlying conditions. Our results indicate that the individual welfare impacts of stay-at-home policies are surprisingly stable across contexts. First, we do not observe important differences in responses between the survey version in which there is a complete lockdown (with restaurants, gyms, and shops closed) and the version with few restrictions on businesses and other entities. Second, we perform our choice experiment with an independent sample of participants eight months after the first survey and find that all our main results remain strikingly similar.

One potential concern with our study is that the respondents did not have any personal experience with stay-at-home orders. It is important to note that while the Swedish Public Health Agency issued recommendations on social distancing, hand hygiene, and voluntary travel restrictions, the Swedish government never adopted a strict stay-at-home policy. Yet, there had been drastic reductions in mobility across all socioeconomic groups already since March, indicating that people were aware of and reacting to the pandemic (Dahlberg et al., 2020). Combined with the extensive media reports of the situation in other countries that had implemented more harsh lockdowns, we believe it is fair to say that subjects had a good understanding of what a stay-at-home policy would mean, in particular for our December 2020 replication.

We hope that this paper will serve as a stepping stone for future research to study the individual welfare impact of stay-at-home policies. Our suggested approach of using a choice experiment to measure the welfare effects of stay-at-home policies can be applied to other countries and contexts, such as different experiences of lockdowns. We believe that understanding how the individual welfare effects differ by individual, context, and country will be of great importance for policymaking not only in response to COVID-19, but also for future pandemics.

Appendix A. Additional tables

Table A1. Descriptive statistics sample

	Description	April		December	
		Mean	Std dev.	Mean	Std dev.
Female	= 1 if female	0.52	0.50	0.54	0.50
Aged 18–29	= 1 if aged between 18 and 29 years	0.15	0.35	0.12	0.33
Aged 30–39	= 1 if aged between 30 and 39 years	0.19	0.39	0.19	0.39
Aged 40–49	= 1 if aged between 40 and 49 years	0.17	0.37	0.18	0.38
Aged 50–59	= 1 if aged between 50 and 59 years	0.23	0.42	0.19	0.39
Aged 60–69	= 1 if aged between 60 and 69 years	0.15	0.36	0.15	0.36
Aged 70–89	= 1 if aged between 70 and 89 years	0.12	0.32	0.17	0.38
Income	Monthly household income in $1,000 per adult household member	2.15	1.24	2.09	1.23
Work	= 1 if respondent works	0.56	0.50	0.51	0.50
University	= 1 if university educated	0.37	0.48	0.36	0.48
One adult	= 1 if only one adult lives in household	0.34	0.48	0.33	0.47
Without children	= 1 if no children live in household	0.69	0.46	0.74	0.44
Big city	= 1 if household is in Stockholm, Gothenburg, or Malmö	0.32	0.46	0.30	0.46
City	= 1 if household is in city with more than 50,000 inhabitants	0.25	0.43	0.25	0.44
Small city	= 1 if household is in city with 20,000–50,000 inhabitants	0.15	0.36	0.15	0.36
Rural	= 1 if household is in a city with fewer than 20,000 inhabitants	0.29	0.45	0.30	0.46

Table A1. Continued

	Description	April		December	
		Mean	Std dev.	Mean	Std dev.
Cannot work from home	= 1 if respondent cannot work from home	0.15	0.36	0.11	0.32
House	= 1 if household lives in a house	0.49	0.50	0.51	0.50
House/apartment size	Size in m^2 per household member	50.41	31.68	52.23	31.47
Garden	= 1 if household has access to a garden	0.58	0.49	0.61	0.49
Balcony	= 1 if household has access to a balcony	0.65	0.48	0.66	0.48

Table A2. Estimated probit model on willingness to participate in voluntary stay-at-home program

	(1)		(2)	
Four weeks	−0.359***	(0.030)	−0.300***	(0.043)
Six weeks	−0.490***	(0.035)	−0.421***	(0.049)
Two hours away from home	−0.452***	(0.036)	−0.453***	(0.047)
Eight hours away from home	−0.072**	(0.032)	−0.073	(0.046)
Version: closed			0.189**	(0.075)
Four weeks * closed			−0.122**	(0.060)
Six weeks * closed			−0.142**	(0.069)
Two hours away from home * closed			0.004	(0.072)
Eight hours away from home * closed			0.008	(0.064)
Compensation in $100	0.475***	(0.019)	0.477***	(0.019)
Constant	−0.142***	(0.041)	−0.236***	(0.055)
Observations	13,455		13,455	

Notes: Models estimated with sampling weights to adjust for over-representation of university-educated respondents. Robust standard errors are given in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

Table A3. WTA for stay-at-home policy in US dollars for the two survey versions

Weeks	Hours away from home allowed		
	14	8	2
		Survey version: closed	
2	11 (11)	29 (10)	113 (10)
4	94 (10)	112 (10)	196 (10)
6	125 (10)	142 (10)	226 (11)
		Survey version: open	
2	36 (10)	52 (10)	139 (9)
4	101 (9)	117 (9)	203 (10)
6	127 (10)	143 (10)	230 (11)

Notes: Estimated mean WTA in US dollars per week and per adult for a household to participate in the program when stores are closed and when they are open. Standard errors obtained by the delta method are given in parentheses.

Table A4. Factor loadings from principal-component factor analysis of health behavior

Health behavior	Factor loadings
Avoids physical social contacts	0.756
Keeps informed about the virus	0.713
Keeps 2 m distance from others	0.755
Avoids private traveling	0.664
Coughs and sneezes into elbow	0.567
Avoids touching her face	0.603
Washes hands more often	0.611
Stays in self-isolation if sick	0.689
Informs others if sick	0.654
Uses face mask if sick	0.339
Goes shopping	−0.272
Does physical activities with others	−0.330
Socializes with friends and family outside the household	−0.385

Table A5. Marginal effects: pooled probit models with heterogeneous effects

	(1)	(2)	(3)
Female	0.071**	0.072**	0.046
	(0.028)	(0.029)	(0.030)
Aged 39–39 years	0.052	0.057	0.051
	(0.050)	(0.050)	(0.050)
Aged 40–49 years	0.041	0.043	0.023
	(0.052)	(0.052)	(0.054)
Aged 50–59 years	0.012	0.015	−0.026
	(0.051)	(0.052)	(0.055)
Aged 60–69 years	−0.087	−0.079	−0.115**
	(0.054)	(0.055)	(0.056)
Aged ≥70 years	−0.112**	−0.101*	−0.151***
	(0.053)	(0.056)	(0.058)
Income per adult	−0.001	0.001	−0.001
	(0.013)	(0.013)	(0.014)
Employed	−0.102***	−0.105***	−0.100**
	(0.038)	(0.039)	(0.039)
University educated	0.032	0.029	0.023
	(0.030)	(0.031)	(0.031)
One adult in household	0.023	0.021	0.029
	(0.032)	(0.036)	(0.036)
No children in household	0.028	0.028	0.021
	(0.037)	(0.040)	(0.040)
Big city (>300,000 inhabitants)	−0.005	−0.021	−0.010
	(0.039)	(0.041)	(0.040)
City (<300,000 and >50,000 inhabitants)	−0.037	−0.051	−0.050
	(0.038)	(0.040)	(0.040)

Table A5. Continued

	(1)	(2)	(3)
Small city (<50,000 inhabitants)	−0.049	−0.057	−0.058
	(0.043)	(0.045)	(0.045)
Cannot work from home		0.008	0.018
		(0.046)	(0.047)
House		−0.030	−0.024
		(0.042)	(0.042)
House/apartment size		−0.000	−0.000
		(0.001)	(0.001)
Have access to garden		0.009	0.019
		(0.041)	(0.042)
Have access to balcony		0.026	0.029
		(0.033)	(0.033)
Good health behavior			0.059***
			(0.021)
Probability of becoming infected			0.006
			(0.057)
Compensation in $100	0.197***	0.197***	0.198***
	(0.010)	(0.010)	(0.010)
Choice experiment attributes	Included	Included	Included
Observations	6,696	6,696	6,696

Notes: Models estimated with sampling weights to adjust for over-representation of university-educated respondents. Marginal effects estimated by keeping all other variables at their means. Choice experiment attributes include dummies for each of the categories of the choice experiment, namely weeks and hours away from home. Robust standard errors are given in parentheses. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Supporting information

Additional supporting information may be found online in the supporting information section at the end of the article.

Online Appendix
Replication files

References

Acemoglu, D., Chernozhukov, V., Werning, I., and Whinston, M. D. (2020), A multi-risk SIR model with optimally targeted lockdown, National Bureau of Economic Research (NBER) Working Paper 27102.

Aguiar, M. and Hurst, E. (2007), Measuring trends in leisure: the allocation of time over five decades, *Quarterly Journal of Economics 122*, 969–1006.

Alvarez, F. E., Argente, D., and Lippi, F. (2021), A simple planning problem for COVID-19 lockdown, testing and tracing, *American Economic Review: Insights 3*, 367–382.

Andersson, O., Campos-Mercade, P., Meier, A., and Wengström, E. (2021), Anticipation of COVID-19 vaccines reduces social distancing, *Journal of Health Economics 80*, 102530.

Barnett, W. (1979), The joint allocation of leisure and goods expenditure, *Econometrica 47*, 539–563.

Benjamin, D. J., Heffetz, O., Kimball, M. S., and Szembrot, N. (2014), Beyond happiness and satisfaction: toward well-being indices based on stated preference, *American Economic Review 104* (9), 2698–2735.

Blackman, A., Alpizar, F., Carlsson, F., and Rivera, M. (2018), A contingent valuation approach to estimating regulatory costs: Mexico's day without driving program, *Journal of the Association of Environmental and Resource Economists 5*, 607–641.

Briggs, A. (2020), Estimating QALY losses associated with deaths in hospital (COVID-19), Avalon Health Economics Research Note.

Boadway, R. (2006), Principles of cost–benefit analysis, *Public Policy Review 2,* 1–44.

Boadway, R. and Keen, M. (1993), Public goods, self-selection and optimal income taxation, *International Economic Review 34*, 463–478.

Campos-Mercade, P., Meier A. N., Schneider, F. H., and Wengström, E. (2021), Prosociality predicts health behaviors during the COVID-19 pandemic, *Journal of Public Economics 195*, 104367.

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., and Zheng, J. (2020), The psychological impact of the COVID-19 epidemic on college students in China, *Psychiatry Research 112934*.

ChoiceMetrics. (2018), *Ngene 1.2 User Manual & Reference Guide*, ChoiceMetrics, Sydney, Australia.

Cropper, M., Jiang, Y., Alberini, A., and Baur, P. (2014), Getting cars off the road: the cost effectiveness of an episodic pollution control program, *Environmental and Resource Economics 57*, 117–143.

Dahlberg, M., Edin, P. A., Grönqvist, E., Lyhagen, J., Östh, J., Siretskiy, A., and Toger, M. (2020), Effects of the COVID-19 pandemic on population mobility under mild policies: causal evidence from Sweden, preprint (arXiv:2004.09087).

Dal Bó, P., Foster, A., and Putterman, L. (2010), Institutions and behavior: experimental evidence on the effects of democracy, *American Economic Review 100* (5), 2205–2229.

Deacon, R. T. and Sonstelie, J. (1985), Rationing by waiting and the value of time: results from a natural experiment, *Journal of Political Economy 93*, 627–647.

Dreze, J. (1998), Distribution matters in cost–benefit analysis: comment on KA Brekke, *Journal of Public Economics 70*, 485–488.

Eichenbaum, M. S., Rebelo, S., and Trabandt, M. (2021), The macroeconomics of epidemics, *Review of Financial Studies 34*, 5149–5187.

Elías, J. J., Lacetera, N., and Macis, M. (2019), Paying for kidneys? A randomized survey and choice experiment, *American Economic Review 109* (8), 2855–2888.

Falk, A., Becker, A., Dohmen, T., Enke, B., Huffman, D., and Sunde, U. (2018), Global evidence on economic preferences, *Quarterly Journal of Economics 133*, 1645–1692.

Farboodi, M., Jarosch, G., and Shimer, R. (2021), Internal and external effects of social distancing in a pandemic, *Journal of Economic Theory 196*, 105293.

Fischer, B., Telser, H., and Zweifel, P. (2018), End-of-life healthcare expenditure: testing economic explanations using a discrete choice experiment, *Journal of Health Economics 60*, 30–38.

Giuntella, O., Hyde, K., Saccardo, S., and Sadoff. S. (2021), Lifestyle and mental health disruptions during COVID-19, *Proceedings of the National Academy of Sciences 118*, e2016632118

Hensher, D. A., Rose, J. M., Rose, J. M., and Greene, W. H. (2005), *Applied Choice Analysis: A Primer*, Cambridge University Press, Cambridge.

Holmes, E. A. et al. (2020), Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science, *The Lancet Psychiatry 7*, 547–560

Holmes, T. P., Adamowicz, W. L., and Carlsson, F. (2017), Choice experiments, in P. Champ et al. (eds.), *A Primer on Nonmarket Valuation*, Springer, Dordrecht.

Johansson-Stenman, O. (2005), Distributional weights in cost–benefit analysis – should we forget about them? *Land Economics 81*, 337–352.
Just, R. E., Hueth, D. L., and Schmitz, A. (2005), *The Welfare Economics of Public Policy: A Practical Approach to Project and Policy Evaluation*, Edward Elgar, Cheltenham, UK.
Kőszegi, B. and Szeidl, A. (2013), A model of focusing in economic choice, *Quarterly Journal of Economics 128*, 53–104.
Layard, R., Clark, A., De Neve, J.-E., Krekel, C., Fancourt, D., Hey, N., and O'Donnell, U. (2020), When to release the lockdown? A wellbeing framework for analysing costs and benefits, Centre for Economic Policy Occasional Paper 49.
Layton, D. and Brown, G. (2000), Heterogeneous preferences regarding global climate change, *Review of Economics and Statistics 82*, 616–624.
McFadden, D. (1974), Conditional logit analysis of qualitative choice behavior, in P. Zarembka (ed.), *Frontiers in Econometrics*, Academic Press, New York, 105–142.
Neumann, P. J., Cohen, J. T., and Weinstein, M. C. (2014), Updating cost-effectiveness-the curious resilience of the $50,000-per-QALY threshold, *New England Journal of Medicine 371*, 796–797.
Pfefferbaum, B. and North, C. S. (2020), Mental health and the Covid-19 pandemic, *New England Journal of Medicine 383*, 510–512.
Phlips, L. (1978), The demand for leisure and money, *Econometrica 46*, 1025–1043.
Ramey, V. A. and Francis, N. (2009), A century of work and leisure, *American Economic Journal: Macroeconomics 1*, 189–224.
Smith, V. K. and Mansfield, C. (1998), Buying time: real and hypothetical offers, *Journal of Environmental Economics and Management 36*, 209–224.
Svensson, M. and Nilsson, F. (2016), *TLV:s betalningsvilja för nya läkemedel har analyserats: Kostnadseffektivitet och sjukdomens svarighetsgrad avgörande för subvention-Cancerläkemedel far kosta mer* (in Swedish), *Läkartidningen 113*, 28–30.
Taub, A. (2020), A new COVID-19 crisis: domestic abuse rises worldwide, *New York Times*, 6 April.
Thunström, L., Newbold, S. C., Finnoff, D., Ashworth, M., and Shogren, J. (2020), The benefits and costs of using social distancing to flatten the curve for COVID-19, *Journal of Benefit–Cost Analysis 11*, 179–195.
Twenge, J. M. and Joiner, T. E. (2020), Mental distress among US adults during the COVID-19 pandemic, *Journal of Clinical Psychology 76*, 2170–2182.

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