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Corona and the Stability of Personal Traits and Preferences: Evidence from Germany

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Manuel Frondel, Daniel Osberghaus, and Stephan Sommer[1]

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Abstract

Based on panel data on around 5,500 German households, this paper analyzes whether the experience of financial losses due to the Corona pandemic has affected three kinds of personal traits and preferences: the willingness to take risks, patience, and the locus of control. Our empirical results indicate that patience and the locus of control remain unchanged by the experience of pandemic-related financial losses, whereas we find a significantly negative effect of severe financial losses on risk taking, contrasting with the traditional assumption that such preferences are constant. In this respect, our heterogeneity analysis indicates that financial losses due to Corona particularly affect the most vulnerable households, notably low-income households and those with little income diversification.

JEL-Code: D91, C23

Keywords: Patience; risk aversion; locus of control

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1 Manuel Frondel, RWI and RUB; Daniel Osberghaus, ZEW; Stephan Sommer, RWI. *- We are highly grateful for valuable comments and suggestions by participants of the ZEW research seminar, Gerhard Kussel, and, in particular, Colin Vance. We gratefully acknowledge financial support by the Collaborative Research Center "Statistical Modeling of Nonlinear Dynamic Processes" (SFB 823) of the German Research Foundation (DFG), Project A3, "Dynamic Technology Modeling", and by the Federal Ministry of Education and Research (BMBF) within the funding measure "Economics of Climate Change", Project Eval-Map II. –* *All correspondence to: Manuel Frondel, RWI, Hohenzollernstr. 1-3, 45128 Essen, Germany, e-mail: frondel@rwi-essen.de*

1 Introduction

Since the plague of the Spanish influenza some one hundred years ago, there has been hardly such a globally devastating disease as that triggered by the COVID-19 virus. As of March 2021, about 2.5 million deaths can be ascribed to this virus (JHU, 2021). All over the world, Corona and the measures to counteract this pandemic have dramatically shaken economies and societies alike, most notably due to the resulting macroeconomic shocks (Alfaro et al., 2020; Altig et al., 2020; Baker et al., 2020).

In addition to grave macroeconomic impacts, the pandemic has substantial microeconomic effects, for example on the well-being of individuals, notably parents (Huebener et al., 2020), and their mental health (Liang et al., 2020). The influence on individual preferences and traits is less clear, though. Many economists have assumed that preferences, such as risk aversion and patience, are immutable individual characteristics – see e.g. Stigler and Becker (1977) and Meier and Sprenger (2015) with respect to risk and time preferences. Yet, the question arises as to whether the drastic restrictions in everyday life and human rights, mandated by governments to limit the Corona pandemic, have systematic effects on individuals' personal traits, such as the long-term preferences relating to risk and time discounting.

This question is highly important, as such preferences are hypothesized to be significant determinants of individual health and welfare, as well as aggregate growth (e.g. Almlund et al., 2011; Becker et al., 2012; Borghans et al., 2008; Heckman et al., 2006). In a similar vein, once formed, non-cognitive skills, such as the locus of control, are typically deemed relatively stable and as important as cognitive ability in explaining economically relevant outcomes (Borghans et al., 2008; Cobb-Clark and Schurer, 2013; Heckman et al., 2006).

Recent insights from behavioral economics and psychology suggest, though, that in-

dividual experiences can strongly affect personal traits, such as those relating to risk and patience (e.g. Malmendier and Nagel, 2011). In particular, a pandemic such as Corona may make people more aware of potential adverse events and their life expectancy may be shorter (Cassar et al., 2017). As a result, those living through a pandemic like Corona may become more averse to risk.

Based on longitudinal survey data on around 5,500 German household heads originating from the years 2012, 2014, 2015, and 2020, this paper analyzes whether the individual experience of financial losses due to the policy measures that were established to counteract the Corona pandemic affects the stability of three kinds of personality characteristics: the willingness to take risks, patience, and the locus of control, measured by the index employed by e. g. Cobb-Clark and Schurer (2013). Using the severity of self-reported financial income losses due to the Corona pandemic as a treatment variable and employing a difference-in-differences approach with household-level fixed effects, we estimate the effect of Corona-related financial losses on the stability of these personal traits and preferences. To this end, self-reported financial losses is the appropriate measure given that it is the perception of these losses, rather than their actual magnitude, that may affect personal traits and preferences.

Our empirical results indicate that patience and the locus of control remain unchanged by the experience of pandemic-related financial losses. Yet, with respect to the willingness to take risks, we find a statistically significantly negative effect of severe financial losses, that is, affected individuals report higher levels of risk aversion. This outcome is in accord with Decker and Schmitz (2016), for instance, who also find that, in contrast to the traditional assumption of constant preferences, risk aversion is not an immutable characteristic. Rather, according to these authors' empirical results, health shocks, measured by an objective indicator, increase individual risk aversion. In a similar vein, using real-time panel data from 2019 and from April to July 2020, Graeber et al. (2020) pro-

vide robust evidence that exposure to the Corona pandemic reduces the risk tolerance of individuals in Germany.

Our results also indicate some heterogeneity: financial losses increase the risk aversion of both economically deprived households and households with little diversity in their income sources, such as single-person, single-parent and low-income households. Altogether, being largely in line with the classical conjecture that preferences are immutable characteristics, with the exception of risk aversion, our findings suggest that the first wave of the the Corona pandemic and the counteracting measures have had only moderate effects on the preferences and personal traits under scrutiny.

The subsequent section describes the panel data set employed for our analysis. Section 3 presents our methodological approach, while the empirical results are discussed in Section 4. The last section summarizes and concludes.

2 Data

For our empirical analysis, we draw on data from the Socio-ecological Panel, which extends through May and June 2020 when the Corona pandemic was highly prevalent in Germany.[1] Commissioned by the Federal Ministry of Education and Research (BMBF), the data covers the years 2012, 2014, 2015, and 2020 and was gathered in collaboration with the market research institute *forsa*, which maintains a representative sample of some 80,000 households.

Questionnaires were addressed to the household heads, that is, those household members who consider themselves responsible for the financial decisions at the household level. *forsa*'s state-of-the-art tool allows panelists to fill out the questionnaire using

[1] More information on the Socio-ecological Panel is available at www.rwi-essen.de/green-soep.

either a television or the internet. Respondents can interrupt and continue the survey at any time. A large set of socio-economic and demographic background information on all household members is available from *forsa*'s household selection procedure and updated regularly.

The questionnaires were developed in several iterations together with survey professionals from *forsa*. Pretests including some 100 households served to prepare the surveys. In each survey wave, about 6,000 respondents completed the questionnaire. Upon dropping observations with missing data in relevant variables, as well as from individuals who did not participate in 2020, the data set employed for our analysis includes 16,163 observations on 5,632 household heads: 3,052 originate from 2012, 3,732 from 2014, 3,747 from 2015, and 5,632 from 2020.

The personal traits and preferences that lie at the heart of our analysis and serve as the dependent variables of our fixed-effects estimations include the willingness to take risks, patience, and the locus of control. The locus of control was measured in two years, 2015 and 2020, risk and time preferences in three years: 2012, 2014, and 2020.

Risk preferences are elicited on an 11-point Likert scale by employing a widely used single-item measure on the willingness to take risks – see e. g. Dohmen et al. (2011). These authors demonstrate that this risk measure is highly correlated with the actual risk taken in lottery experiments. Moreover, recent research has demonstrated that this self-reported risk preference measure even outperforms revealed measures of risk appetite (Arslan et al., 2020; Hertwig et al., 2019). The underlying question asks subjects: "Are you generally a person who is willing to take risks or do you try to avoid taking risks?", with responses ranging from 0: "not at all willing to take risks" to 10: "very willing to take risks". In our estimation sample, the mode of risk taking amounts to five points and thus corresponds to the results of Dohmen et al. (2011), who base their analysis on the representative German Socio-economic Panel (SOEP). In addition, the sample mean of

5.8 is very similar compared to that found by León and Pfeifer (2017), who employ SOEP data for the years 2003 and 2004. Yet, the summary statistics reported in Table 1 indicate a large variation in this preference measure, as well as in the other measures under scrutiny (see also Figure A1a in the appendix).

Table 1: Summary Statistics

	Description	Mean	Std. Dev.	Min.	Max.
Dependent variables:					
Risk taking	0: not at all willing to take risks – 10: very willing to take risks	4.74	1.98	0	10
Patience	0: very impatient – 10: very patient	5.89	2.32	0	10
Locus of control	7: internal LOC – 49: external LOC	19.91	6.91	7	49
Treatment variables:					
Financial losses	Dummy: 1 if a household experienced any financial losses due to Corona	0.50	–	0	1
Severe financial losses	Dummy: 1 if a household experienced large or very large financial losses due to Corona	0.08	–	0	1
Covariates:					
Household size	Number of household members	2.13	1.00	1	5
Full-time employed	Dummy: 1 if the household head is full-time employed	0.62	–	0	1
Household income	Household income categories in steps of €500	5.63	2.72	1	11
Home owner	Dummy: 1 if the household owns its dwelling	0.63	–	0	1
Living with partner	Dummy: 1 if the household head lives with a partner	0.69	0.46	0	1
Underage children	Dummy: 1 if there are children with an age less than 15 years	0.71	0.45	0	1
7-days Incidence	Incidence of COVID-19 cases per 100,000 inhabitants in the last 7 days	1.56	4.01	0	80.6

Note: The summary statistics on financial losses, as well as the 7-days incidence, only refer to Corona year 2020.

Next, the measure of patience is based on and validated by Vischer et al. (2013). The exact wording of the question on patience reads: "Are you generally an impatient person or someone who always shows great patience?". Answers are coded on an 11-point Likert scale again, with responses ranging from 0, referring to "very impatient", to 10, referring to "very patient". Vischer et al. (2013) show that this measure is highly correlated with more sophisticated experimental measures (Frederick et al., 2002). With

a mean of about six points (Table 1) and a mode of five points (Figure A1b), our sample exhibits a distribution of time preferences that is comparable to those of Vischer et al. (2013) and Heywood et al. (2017), which are based on the SOEP.

Lastly, using the original items from the Psychological Coping Resources component of the Mastery Module by Pearlin and Schooler (1978), we measure the locus of control, that is, the extent to which an individual believes that events in life are shaped by own actions. While individuals with an internal locus of control tend to believe that they have control over the outcome of events in their lives, those with an external locus of control tend to believe that much of what happens is beyond their control. Life's outcomes are thus attributed to external forces, like fate, luck, or other people (Caliendo et al., 2015). In contrast, people with an internal locus of control see future outcomes as being contingent on their own decisions and behavior. It seems sensible to expect that the locus of control will have a notable effect on many economic outcomes and, in particular, that internality increases the potential for economic success.

Following Cobb-Clark and Schurer (2013) and accounting for the distinction between internal and external locus of control, the locus of control (LOC) index employed for our analysis is computed as follows:

$$LOC_i = \sum_{j=1}^{5} ELOC_{ij} - \sum_{j=6}^{7} ILOC_{ij} + 16, \tag{1}$$

where $ELOC$ and $ILOC$ refer to the items of the questionnaire with which the external and internal locus of control is elicited, respectively – see the appendix for the detailed presentation of the items.

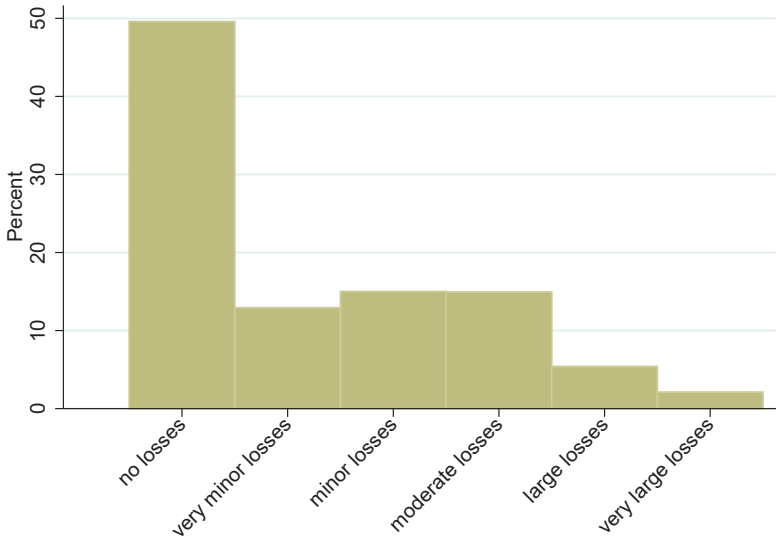
The first five out of seven items serve to elicit the external locus of control, the remaining two aim at capturing the internal locus of control. Responses to each item are coded on a 7-point scale, ranging from 1: "I strongly disagree" to 7: "I strongly agree".

With the aggregate values being between 7 and 49, the LOC index takes on the lowest value of 7 in the polar case in which a respondent strongly disagrees with the five items on the external locus of control, but strongly agrees with the two items of the internal locus of control, thus indicating strong internal self-control. The opposite holds true if the index equals 49, indicating an external locus of control. The mean value resulting from our sample amounts to about 20 (see Table 1), is right-skewed (Figure A1c), and is driven by low values on the last two, internally-orientated survey items. Compared with the analysis of Cobb-Clark and Schurer (2013) for Australia, the mean score of our estimation sample is somewhat lower, indicating a more internal locus of control, whereas it is somewhat higher than that found by Cobb-Clark and Tan (2011).

To capture Corona-related financial losses, we requested survey participants to indicate the severity of their financial losses due to the Corona crisis on a 6-point scale, ranging from "I have not experienced any losses" to "very large losses"(see Figure 1). Roughly half of the responding household heads report some financial losses, with about 8% suffering from either large or very large losses (see Table 1). Exploiting this information, we define two dummy variables indicating either any financial losses or severe financial losses, with the latter variable equaling unity if a household experienced large or very large losses due to Corona in 2020 and equaling zero otherwise, while the binary variable "financial losses" equals unity if a household experienced any losses due to Corona and equals zero otherwise. Obviously, for all observations prior to 2020, both these indicators equal zero.

In addition to these key variables, a suite of covariates are added to the model specification of our fixed-effects estimations (see Table 1), including the incidence of confirmed positive COVID-19 cases per 100,000 inhabitants in a respondent's municipality during the 7 days prior to the day of survey participation. This data serves to control for the regional infection dynamics at the time of the survey. It is merged to our panel data set

Figure 1: Experienced Financial Losses due to the Corona Pandemic in 2020



and originates from the COVID-19-Dashboard of the Robert Koch Institute (RKI, 2021), the government's central scientific institution in the field of biomedicine.

Finally, as we base our empirical analysis on fixed-effects estimations, only time-variant variables are added as covariates, such as employment status, household size and income, home ownership, whether underage children live in the household, and whether the household head is living with a spouse or a partner. On average, survey participants are slightly better educated and have a somewhat higher income than typical household heads, indicating that our sample is not representative for the German population – see Frondel et al. (2020, 2021) for more descriptive statistics on the 2020 survey.

3 Methodology

To gauge the effect of Corona-related financial losses on the stability of various personal characteristics, we estimate the following fixed-effects model with reported finan-

cial losses due to Corona as the treatment variable:

$$y_{it} = \alpha \cdot \text{loss}_{it} + \boldsymbol{\beta}^T \mathbf{x}_{it} + \tau_t + \mu_i + \psi_{st} + \xi_w + \epsilon_{it}, \tag{2}$$

where y_{it} stands for the dependent variable, reflecting either the willingness to take risks, patience, or the locus of control of household i in year t. The key regressor, called loss, captures either of the two binary loss variables indicating either any financial loss or severe financial losses due to Corona. Altogether, we estimate six specifications, with either of three dependent variables and either of two loss variables as key ingredients.

In addition to the vector $\mathbf{x}$ of time-variant control variables, a suite of fixed effects are included in all specifications: Apart from household fixed effects μ_i, which capture time-invariant personal and household characteristics, and year fixed effects τ_t, we include year-by-federal-state fixed effects, denoted by ψ_{st}, to control for state-specific year effects. To also control for nationwide short-time variation during the pandemic in 2020, week fixed effects ξ_w are added. Finally, ϵ designates the idiosyncratic error term and α, as well as $\boldsymbol{\beta}$, denote the parameters to be estimated, where T is an indicator of the transposition of vector $\boldsymbol{\beta}$.

In addition to exploring average effects, we investigate whether there is heterogeneity in the response to Corona-related financial losses. To this end, we augment specification (2) by interacting the loss variables with household characteristics, such as gender of the household head, household income, residence in East Germany, and other covariates.

Whether we can ascribe a causal interpretation to the coefficient estimates of the loss variables rests crucially on the conditional independence assumption (CIA), which requires that all factors that influence financial losses and are potentially related to personal traits and preferences are observable. Of course, while bias from omitted variables can never be completely ruled out, several features of the methodological set-up lend

support to the validity of the conditional independence assumption.

First, there seems to be little room for the omission of time-varying determinants that are not already captured by all the fixed effects that we have included in specification (2), such as year fixed effects, state-specific year effects, as well as week-specific effects for Corona year 2020. Second, coupled with the controls for time-varying socioeconomic and demographic characteristics, biases that could otherwise emerge from the correlation of unobserved household characteristics with the loss variables appear to be unlikely.

4 Results

Starting with the results of a pre-treatment analysis, we present the time trends of financially affected versus unaffected households for risk taking and patience prior to Corona year 2020. Given that these characteristics were measured in three survey years, 2012, 2014, and 2020, they are qualified for such a pre-treatment analysis, whereas this does not hold true for the locus of control, which was observed only once before 2020, in 2015. Our pre-treatment analysis suggests that there are no substantial inter-temporal differences in the mean levels of risk-taking behavior and patience (see Figure A2 and Figure A3 in the appendix).

In addition, the mean differences in these characteristics across treatment groups are negligible in statistical terms, with the combination of any financial losses and the willingness to take risks being the sole exception, as there is some statistical evidence that the respective means diverge in 2014 (Figure A2a). In absolute terms, though, this difference is virtually negligible. The finding of stable preferences with respect to patience and locus of control during the observation period of more than half a decade corroborates the hypothesis that it is severe financial losses due to the Corona pandemic that is responsible

for the change in risk taking.

The results of our fixed-effects estimations are presented in the following tables, with Table 2 reporting the results for any financial losses as treatment variable and Table 3 focusing on the effects of severe financial losses. To ease the interpretation of the outcomes, we standardize their values by substracting the mean and dividing the result by the respective standard deviation. Focusing first on the relationship between any financial losses and personality characteristics, we hardly find any effect: throughout, coefficient estimates are indistinguishable from zero at conventional significance levels (Table 2). Yet, when we consider severe, rather than any financial losses, our results indicate that the Corona pandemic has led to a moderate reduction in the willingness to take risks, with the effect amounting to 0.121 standard deviations (Table 3), which corresponds to a reduction of 0.24 points on the original scale, equaling a relative decrease of about 4%.

Table 2: Fixed Effects Estimation Results of Any Financial Losses due to the Corona Pandemic on Personal Traits and Preferences

	Risk taking		Patience		Locus of control	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Financial losses	-0.043	(0.031)	-0.036	(0.031)	0.031	(0.035)
Household size	-0.042	(0.022)	-0.004	(0.022)	0.051	(0.031)
Full-time employed	-0.026	(0.038)	-0.041	(0.038)	0.002	(0.047)
Household income	0.013	(0.009)	0.001	(0.009)	-0.003	(0.012)
Home owner	0.074	(0.051)	0.052	(0.051)	-0.022	(0.070)
Living with partner	-0.013	(0.046)	0.009	(0.046)	0.072	(0.067)
Children	0.005	(0.068)	0.048	(0.068)	-0.042	(0.088)
7-days Incidence	-0.003	(0.003)	0.002	(0.003)	0.002	(0.003)
Constant	0.251	(0.239)	-0.043	(0.239)	-0.269	(0.277)
State	Yes		Yes		Yes	
Year	Yes		Yes		Yes	
Year × State	Yes		Yes		Yes	
Weeks of Survey 2020	Yes		Yes		Yes	
No. of observations	10,330		10,332		7,919	

Note: ** and * denote statistical significance at the 1 % and 5 %, level, respectively.

This result adds to the growing empirical evidence that risk preferences are mutable, rather than stable. For instance, the increase in risk aversion aligns with the findings of Decker and Schmitz (2016), who concentrate on the role of health shocks, as well as with those of Hetschko and Preuss (2020), who analyze the effect of job losses, and Cassar et al. (2017), who find that the 2004 tsunami in Thailand increased risk aversion. According to Guiso et al. (2018), who analyze the effects of the Italian banking crisis, increases in risk aversion are triggered by scary experiences. This explanation might carry over to the case of the Corona pandemic: While its effects are highly uncertain, following the news coverage on Corona might be unsettling.

Table 3: Fixed Effects Estimation Results of Severe Financial losses due to the Corona pandemic on Personal Traits and Preferences

	Risk taking		Patience		Locus of control	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
Severe financial losses	-0.121*	(0.060)	0.031	(0.060)	-0.016	(0.069)
Household size	-0.040	(0.022)	-0.004	(0.022)	0.050	(0.031)
Full-time employed	-0.026	(0.038)	-0.045	(0.038)	0.004	(0.047)
Household income	0.012	(0.009)	0.002	(0.009)	-0.004	(0.012)
Home owner	0.072	(0.051)	0.051	(0.051)	-0.021	(0.070)
Living with partner	-0.017	(0.046)	0.008	(0.046)	0.074	(0.067)
Children	0.006	(0.068)	0.047	(0.068)	-0.041	(0.088)
7-days incidence	-0.003	(0.003)	0.002	(0.003)	0.002	(0.003)
Constant	0.245	(0.239)	-0.051	(0.239)	-0.261	(0.277)
State	Yes		Yes		Yes	
Year	Yes		Yes		Yes	
Year × State	Yes		Yes		Yes	
Weeks of Survey 2020	Yes		Yes		Yes	
No. of observations	10,305		10,306		7,901	

Note: ** and * denote statistical significance at the 1 % and 5 %, level, respectively.

In contrast to risk taking, we do not find any effects for patience and locus of control, suggesting that these traits remain fairly stable even in times of the Corona pandemic. This outcome is in line with Meier and Sprenger (2015), for instance, who find stable

time preferences using incentivized experiments, but contrasts with the finding of Cassar et al. (2017) that experiencing a potentially decisive turning point in life, such as the 2004 tsunami in Thailand, affects impatience. Furthermore, in accord with Cobb-Clark and Schurer (2013), who show that the locus of control is rather stable and not related to, e.g. health events, our results indicate that the locus of control remains unaffected even in times of a global pandemic such as Corona, whereas Preuss and Hennecke (2017) identify involuntary job loss as a trigger for a temporal shift in locus of control.

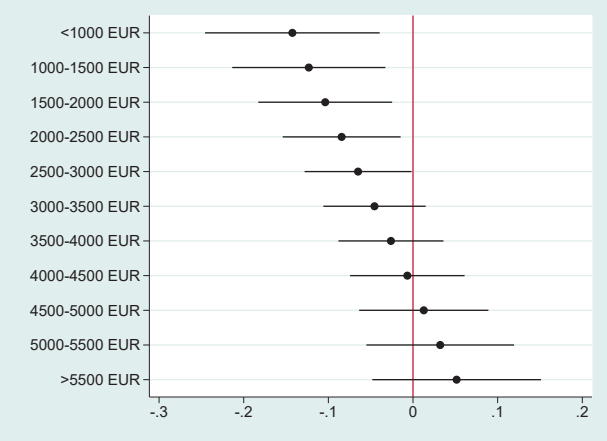
Taken together, while individuals who report severe financial losses due to the Corona pandemic tend to become somewhat more risk averse, our results are largely in accordance with the classical conjecture that personal traits and preferences are immutable characteristics. This finding is accompanied by the fact that none of the control variables has any significant bearing. Most notably, in contrast to the findings of Graeber et al. (2020), the incidence of COVID-19 cases in the previous seven days in the region where a respondent resides does not affect individual risk preferences, nor do the other personal characteristics under scrutiny.

In what follows, we aim at identifying those types of individuals who are particularly responsive to Corona-related financial losses. To this end, we systematically analyze whether there is effect heterogeneity by estimating the interaction effects of any financial losses with covariates such as gender of household head, being a homeowner, residence in East Germany, employment status, living with a partner and underage children, as well as household income.

The results of this exercise, illustrated by the following figures, demonstrate that for the willingness to take risks, treatment effects vary substantially with socio-economic characteristics, most notably with household income. Figure 2 indicates that there is a particularly pronounced effect of financial losses on respondents with low incomes. At least in terms of risk taking, it seems that Corona-induced financial losses more strongly affect

those who are among the more vulnerable in society, an impression that is reconfirmed by the interaction effects with respect to other socio-economic characteristics presented in Figure 3.

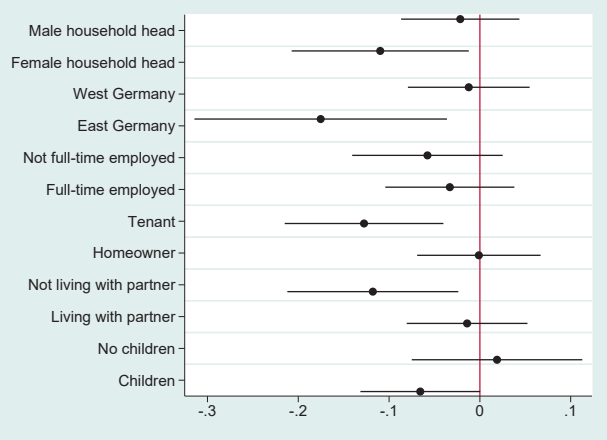
Figure 2: Effect of Any Financial Losses on Risk Taking Contingent on Household Income – Point Estimates and 95% Confidence Intervals



In particular, the effect of financial losses tends to be larger for tenants, female-headed households, and those household heads who live without a partner (Figure 3). In short, the impact of financial losses on risk taking appears to be higher among economically deprived households, as well as households that have presumably little diversity in their income sources, such as single-person households and households with heads who are not full-time employed.

In contrast, while not reported here, for patience, we find no statistically significant interaction effects, corroborating our conclusion that Corona-related financial losses have hardly any effect on the stability of this personal trait. Lastly, with respect to the locus of control, both financial loss variables yield a significantly positive effect amongst female household heads, but no significant impact on males. Results with respect to locus of control, however, should be treated with caution given that we cannot rule out pre-treatment differences.

Figure 3: Heterogeneity in the Impact of Any Financial Losses on Risk Taking – Point Estimates and 95% Confidence Intervals



5 Summary and Conclusions

While economists increasingly believe that personal traits and preferences can have important consequences for individuals' economic decisions (Cobb-Clark and Schurer, 2012), empirical studies that attempt to estimate the economic returns to personality often assume that adults' personal traits are fixed (Nyhus and Pons, 2005). This is a convenient assumption because it implies that personal traits remain unaffected by the economic outcome under scrutiny, such as health status and labor market participation. If this assumption does not hold, however, simultaneity and reverse causality may bias the empirical results (Cobb-Clark and Schurer, 2012).

There is growing empirical evidence, though, that negative experiences can strongly affect personal traits and preferences. For instance, Decker and Schmitz (2016) find that health shocks increase individual risk aversion. Given the threat to our health and lives due to the COVID-19 virus, the question arises as to whether the Corona pandemic has the potential to substantially change personal traits and preferences, such as patience and risk aversion.

In an attempt to answer this question, based on panel data on around 5,500 German

citizens originating from surveys conducted in the years 2012, 2014, 2015, and 2020, this paper has analyzed whether the experience of financial losses due to the Corona pandemic affects the stability of three kinds of personality characteristics: the willingness to take risks, patience, and the locus of control. Our empirical results indicate that patience and the locus of control remain unchanged by the experience of pandemic-related financial losses, whereas we find a significantly negative effect of severe financial losses on risk taking. In this respect, our heterogeneity analysis has demonstrated that financial losses due to the Corona pandemic particularly affect the most vulnerable households, notably low-income households and those with little income diversification.

Our paper contributes to the emerging literature that deals with the stability of personal traits and preferences and adds to the growing empirical evidence that risk preferences are mutable, rather than stable. According to our results, drastic events, such as the health and financial shocks due to the Corona pandemic, may well influence the degree of risk seeking of an individual. Therefore, treating personal traits and preferences to be constant may bias empirical applications in which they are assumed to be time-invariant and captured by individual fixed effects.

Investigations on the impact of a disastrous event, such as the Corona pandemic, which obviously involves grave health risks, are highly important, not least because increased risk aversion could diminish the propensity to invest and consume, thereby delaying the economic recovery after the pandemic. This looms particularly large as, according to our results, the risk aversion of respondents with low incomes, who spend a larger fraction of their income on consumption than affluent households, is strongly affected. Given that our observations originate from the time between the first and second wave of the Corona pandemic in Germany and, hence, the effects of the second, more severe infection wave are not captured by our analysis, an important avenue for future research would be to analyze the dynamic effects of the pandemic with respect to personal traits

and preferences on the basis of additional panel data covering the second Corona wave.

A Appendix

A.1 Locus of Control

Employing the original items from the Psychological Coping Resources component of the Mastery Module by Pearlin and Schooler (1978), we elicited the locus of control using the battery of seven statements reported below. In detail, respondents were asked: "The following statements characterize different attitudes towards life and the future. To what extent do you personally agree with these statements? Please answer on the basis of a scale of 1 to 7: I strongly disagree [1] – I strongly agree [7]".

- 5 Items on External Locus of Control:

Item 1: I have little control over the things that happen to me.

Item 2: There is really no way I can solve some of the problems I have.

Item 3: There is little I can do to change many of the important things in my life.

Item 4: I often feel helpless in dealing with the problems of life.

Item 5: Sometimes I feel that I'm being pushed around in life.

- 2 Items on Internal Locus of Control:

Item 6: What happens to me in the future mostly depends on me.

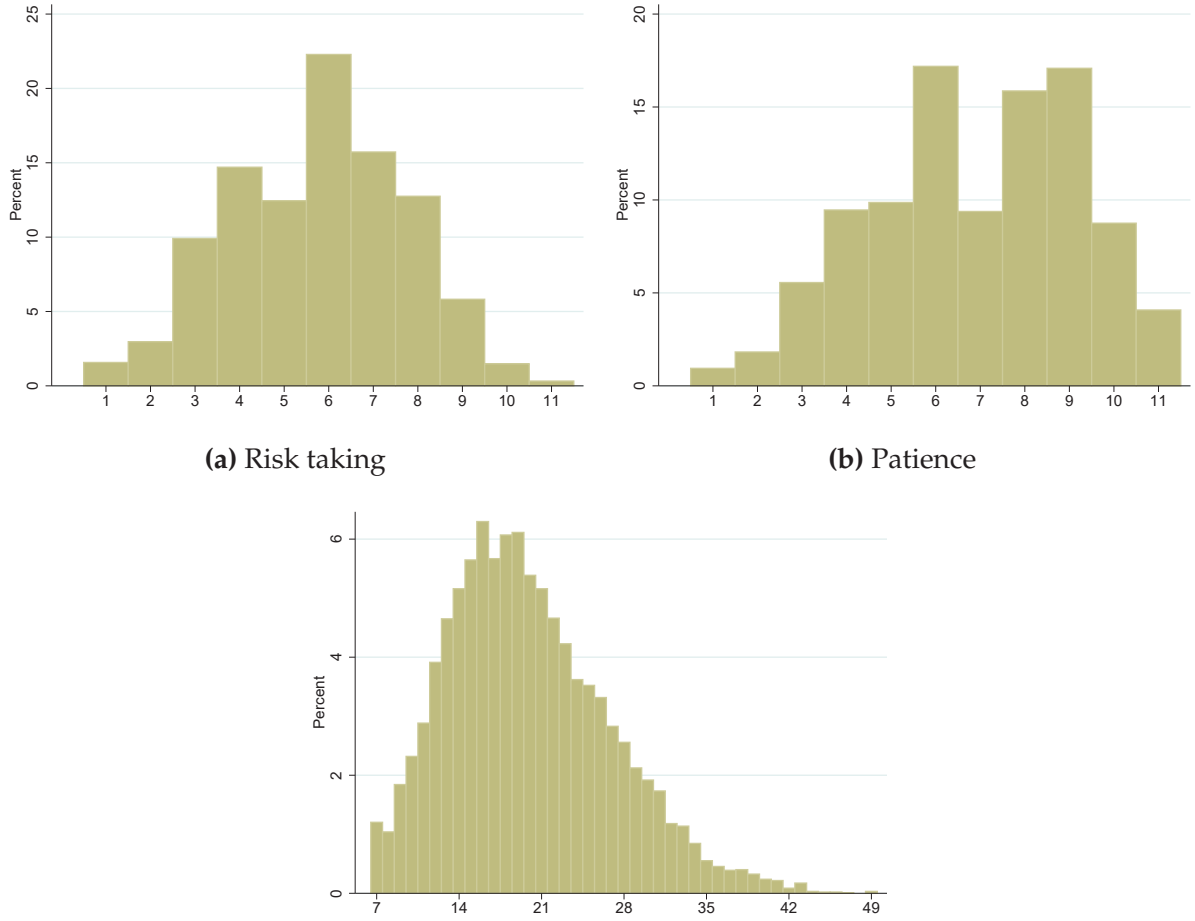
Item 7: I can do just about anything I really set my mind to do.

Assigning large values to items 1 to 5 indicates "external" locus of control, meaning that a person tends to associate outcomes in life, such as personal success, to external factors, while high values with respect to items 6 and 7 indicate "internal" locus of control, according to which a person tends to associate outcomes with her own efforts (Gatz and

Karel, 1993). Based on definition (1), the assessments of all seven items are condensed into a single measure, the LOC index, for which large values imply a high external locus of control, whereas low values indicate a high internal locus of control.

A.2 Figures

Figure A1: Distribution of the Scores of Willingness to Take Risks, Patience, and Locus of Control

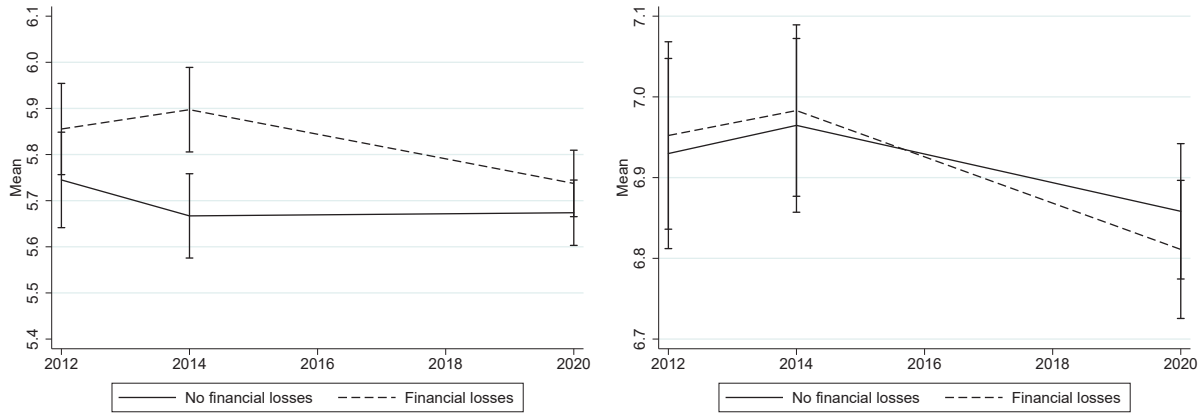


(a) Risk taking

(b) Patience

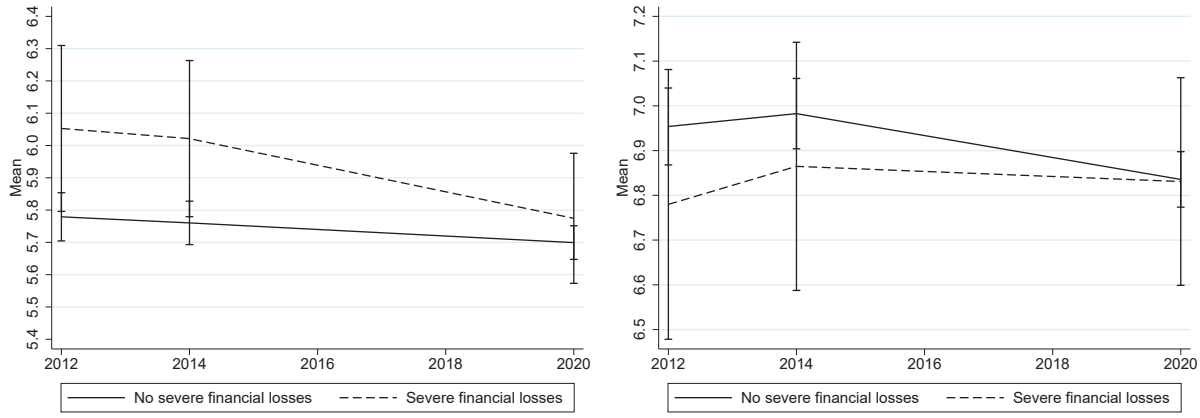
(c) Locus of control

Figure A2: Trends in Willingness to Take Risks and Patience by Suffering from Any Corona-related Financial Losses.



(a) Risk taking **(b)** Patience

Figure A3: Trends in Willingness to Take Risks and Patience by Suffering from Corona-related Severe Financial Losses.



(a) Risk taking **(b)** Patience

References

Alfaro, L., Chari, A., Greenland, A. N., and Schott, P. K. (2020). Aggregate and firm-level stock returns during pandemics, in real time. NBER Working Paper 26950.

Almlund, M., Duckworth, A. L., Heckman, J., and Kautz, T. (2011). Personality psychology and economics. *In: Handbook of the Economics of Education*, 4:1–181.

Altig, D., Baker, S., Barrero, J. M., Bloom, N., Bunn, P., Chen, S., Davis, S. J., Leather, J., Meyer, B., Mihaylov, E., Mizen, P., Parker, N., Renault, T., Smietanke, P., and Thwaites, G. (2020). Economic uncertainty before and during the COVID-19 pandemic. *Journal of Public Economics*, 191:104274.

Arslan, R. C., Brümmer, M., Dohmen, T., Drewelies, J., Hertwig, R., and Wagner, G. G. (2020). How people know their risk preference. *Scientific Reports*, 10(1):1–14.

Baker, S. R., Bloom, N., Davis, S. J., and Terry, S. J. (2020). Covid-induced economic uncertainty. NBER Working Paper 26983.

Becker, A., Deckers, T., Dohmen, T., Falk, A., and Kosse, F. (2012). The relationship between economic preferences and psychological personality measures. *Annual Review of Economics*, 4(1):453–478.

Borghans, L., Duckworth, A. L., Heckman, J. J., and Ter Weel, B. (2008). The economics and psychology of personality traits. *Journal of Human Resources*, 43(4):972–1059.

Caliendo, M., Cobb-Clark, D. A., and Uhlendorff, A. (2015). Locus of control and job search strategies. *Review of Economics and Statistics*, 97(1):88–103.

Cassar, A., Healy, A., and Von Kessler, C. (2017). Trust, risk, and time preferences after a natural disaster: Experimental evidence from Thailand. *World Development*, 94:90–105.

Cobb-Clark, D. A. and Schurer, S. (2012). The stability of big-five personality traits. *Economics Letters*, 115(1):11–15.

Cobb-Clark, D. A. and Schurer, S. (2013). Two economists' musings on the stability of locus of control. *Economic Journal*, 123(570):F358–F400.

Cobb-Clark, D. A. and Tan, M. (2011). Noncognitive skills, occupational attainment, and relative wages. *Labour Economics*, 18(1):1–13.

Decker, S. and Schmitz, H. (2016). Health shocks and risk aversion. *Journal of Health Economics*, 50:156–170.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., and Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association*, 9(3):522–550.

Frederick, S., Loewenstein, G., and O'Donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, 40(2):351–401.

Frondel, M., Kükenthal, V. C., Larysch, T., and Osberghaus, D. (2021). Klimawandel in Deutschland: Risikowahrnehmung privater Haushalte 2012-2020. *Zeitschrift für Energiewirtschaft*, 45(2):forthcoming.

Frondel, M., Kussel, G., Larysch, T., and Osberghaus, D. (2020). Klimapolitik während der Corona-Pandemie: Ergebnisse einer Haushaltserhebung. *Zeitschrift für Umweltpolitik und Umweltrecht*, 43(4):402–425.

Gatz, M. and Karel, M. J. (1993). Individual change in perceived control over 20 years. *International Journal of Behavioral Development*, 16(2):305–322.

Graeber, D., Schmidt, U., Schröder, C., and Seebauer, J. (2020). The effect of a major pandemic on risk preferences – evidence from exposure to COVID-19. *SSRN Paper 3724461*.

Guiso, L., Sapienza, P., and Zingales, L. (2018). Time varying risk aversion. *Journal of Financial Economics*, 128(3):403–421.

Heckman, J. J., Stixrud, J., and Urzua, S. (2006). The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor Economics*, 24(3):411–482.

Hertwig, R., Wulff, D. U., and Mata, R. (2019). Three gaps and what they may mean for risk preference. *Philosophical Transactions of the Royal Society B*, 374(1766):20180140.

Hetschko, C. and Preuss, M. (2020). Income in jeopardy: How losing employment affects the willingness to take risks. *Journal of Economic Psychology*, 79:102175.

Heywood, J. S., Jirjahn, U., and Struewing, C. (2017). Locus of control and performance appraisal. *Journal of Economic Behavior & Organization*, 142:205–225.

Huebener, M., Waights, S., Spiess, C. K., Siegel, N. A., and Wagner, G. G. (2020). Parental well-being in times of Covid-19 in Germany. *Review of Economics of the Household*, ?:forthcoming.

JHU (2021). COVID-19 Dashboard. Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). `https://coronavirus.jhu.edu/map.html`.

León, A. K. and Pfeifer, C. (2017). Religious activity, risk-taking preferences and financial behaviour: Empirical evidence from German survey data. *Journal of Behavioral and Experimental Economics*, 69:99–107.

Liang, L., Ren, H., Cao, R., Hu, Y., Qin, Z., Li, C., and Mei, S. (2020). The effect of COVID-19 on youth mental health. *Psychiatric Quarterly*, 91(3):841–852.

Malmendier, U. and Nagel, S. (2011). Depression babies: Do macroeconomic experiences affect risk-taking? *Quarterly Journal of Economics*, 126:373–416.

Meier, S. and Sprenger, C. D. (2015). Temporal stability of time preferences. *Review of Economics and Statistics*, 97(2):273–286.

Nyhus, E. K. and Pons, E. (2005). The effects of personality on earnings. *Journal of Economic Psychology*, 26(3):363–384.

Pearlin, L. I. and Schooler, C. (1978). The structure of coping. *Journal of Health and Social Behavior*, 19(1):2–21.

Preuss, M. and Hennecke, J. (2017). Biased by success and failure: How unemployment shapes stated locus of control. Diskussionsbeiträge, No. 2017/29, Freie Universität Berlin.

RKI (2021). COVID-19 Dashboard. Robert-Koch-Institut. `https://corona.rki.de`.

Stigler, G. J. and Becker, G. S. (1977). De gustibus non est disputandum. *American Economic Review*, 67(2):76–90.

Vischer, T., Dohmen, T., Falk, A., Huffman, D., Schupp, J., Sunde, U., and Wagner, G. G. (2013). Validating an ultra-short survey measure of patience. *Economics Letters*, 120(2):142–145.