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How Does Exposure to COVID-19 Influence Health and Income Inequality Aversion?

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ABSTRACT

How Does Exposure to COVID-19 Influence Health and Income Inequality Aversion?*

We study whether exposure to COVID-19 has affected individual aversion to health and income inequality in the UK, Italy, and Germany, as well as the effect of personal shocks on employment (redundancies, government replacement salary and unemployment), income and health directly linked to COVID-19. We find that conditioned on risk aversion and relevant covariates (income, education, demographics), individuals who have experienced either a health or an financial shock during the COVID-19 pandemic, exhibit lower inequality aversion in terms of health and income, compared to those who have not experienced these shocks. Comparing levels of health and income inequality aversion in the UK between the years 2016 and 2020 we find a significant increase in inequality aversion from 2016 to 2020 in both health (17.3%) and income domains (8.8%). However, our difference-in-differences (DiD) for treatment (risk) groups defined in terms of age, region and personal exposure to health and income shocks in 2020 compared to 2016, does not indicate any additional difference in inequality aversion. The exception being individuals who are both in a high-risk age group and at the same time also experienced a health shock in 2020 compared to 2016, which are significantly more inequality averse in both health and income domains.

JEL Classification: I18, I30, I38

Keywords: inequality aversion, income, health, COVID-19, attitudes to inequality, employment shocks, health shocks, difference in differences

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1. Introduction

Inequality preferences play an important role in modern society: they are partially responsible for the observed levels of inequality and they may inform public policy decisions. Inequality preferences reflect personal social concerns with respect to the distribution of welfare in society, which economic theory conceptualises as ‘inequality aversion’, and generally capture the welfare loss from higher inequality in society: Atkinson (1970) defined inequality aversion as ‘the amount society is willing to *give up* to achieve a more egalitarian distribution’¹. Their role in informing policy is especially important when society undergoes a significant health shock such as a global pandemic. It is important to understand the stability of inequality preferences and whether sudden changes in social and individual need in the context of a pandemic such as COVID-19 play a role. Anecdotal evidence suggests that changes in people’s needs resulting from exogenous shocks can reduce their tolerance of inequality.² So, in times of high uncertainty, inequality aversion can be understood as a channel through which the will is expressed to protect the resources required to maintain welfare levels. However, the evidence for this is limited and this paper contributes to the study of inequality aversion, especially focusing on the effects of the COVID-19 pandemic.

Inequality preferences cannot be assumed to be uniform and stable across different domains. Indeed, the theory of *specific egalitarianism* (Tobin, 1970) suggests that the extent of inequality aversion may depend on the domain in life one focuses on, and luck egalitarianist approaches distinguish the justice (or legitimacy) of inequalities across different domains based on how much ‘luck’ (e.g., genetic)

¹ By extension, an individual’s degree of inequality aversion represents their ethical judgement about how far society should forgo increases in total outcomes to achieve a more egalitarian distribution of outcomes. A few studies have focused on estimating inequality aversion in different welfare domains using experimental, and representative survey data (Amiel et al., 1999, Pirttila and Uusitalo, 2010, Johansson-Stenman et al., 2002, Carlsson et al., 2005).

² Tricomi *et al* (2010) find neural evidence (changes in two areas of the brain, the ventral striatum and ventromedial prefrontal Cortex) suggesting that highly paid individuals exhibit higher gains from paying others as compared to paying themselves.

is responsible for such inequalities (Barry, 2006). Inequalities that result from pandemics such as COVID-19 might engender some form of luck egalitarianism, whereby inequalities not deriving from choice but from unforeseen circumstances are perceived as unjust (Wikler, 2002). The two domains of interest in this study, namely health and income, are intimately related. Higher incomes allow individuals to invest in health inputs (e.g., nutritious food, exercise, free time etc) and protective health environments (e.g., access to nature), and such health investment might render labour market returns, that result in higher income (even when effects on wages are more mixed).

Individuals might still differ in their sensitivity to inequality across domains due to differing perceptions of welfare across them. Income is clearly measurable, and often is perceived as resulting from different effort (although peoples wages might not always vary dramatically with changes in effort) and entrepreneurship, can be stocked up as wealth, is easily transferable between individuals, and has purely instrumental rather than intrinsic value. Health on the other hand is much harder to measure, is often perceived as influenced by genetic endowments (although it can be modified by people's health behaviours and healthy environments), is typically thought of as a current state rather than a stock, is difficult to perceive transferring between individuals and has both instrumental and intrinsic value.

Inequality concerns are not always perceived in the same way across societies (Gimpelson and Treisman, 2018). Some studies find that living in an unequal society makes people more sensitive to inequality as a coping mechanism (Benabou and Tirole, 2006). Other studies also find that income matters more for wellbeing in societies with higher levels of income inequality (Machia et al, 2020). However, most of the literature focusing on inequality preferences typically does not capture the trade-offs policy makers have to engage with in their decisions. Attitudinal data often disregard the fact that

reducing inequality can be costly and may entail a sacrifice in terms of average levels of income or health achieved in a society. This is an important question as welfare effects of different interventions focusing solely on average health or income but disregarding their distributions, might fail to capture their true welfare effects.

This paper will address these various complications highlighted above. First, we examine inequality preferences in both health and income domains using a comparable instrument. Second, we examine the effect of risk exposure to COVID-19 both across three European countries (UK, Germany, and France) and their regions, and over time in one country, the UK. We employ a measure of inequality aversion that captures the trade-off between improving average levels of income and health and reducing inequality in each respective domain. The measure we use has been pre-tested and its easy for an average individual to understand³. Finally, we can control for a number of important controls for risk preferences, income and other covariates influencing inequality preferences.

The COVID-19 pandemic has had far reaching effects across Europe with the European Centre for Disease control and Prevention reporting 4.2 million confirmed cases of the virus and over 196,000 deaths (ECDC, 2020). Research reveals that the COVID-19 pandemic has already given rise to declines in financial income and wealth (Hanspal *et al.* 2020), which has strained government welfare programs (Bitler *et al.* 2020) and increased economic anxiety (Fetzer *et al.* 2002). This provides a valuable opportunity to examine behavioural reactions among individuals most affected either by health and employment shocks, or in regions and age groups most affected by COVID-19. In doing so we need to understand the roles of risk aversion, specific risk perceptions regarding COVID-19, and personal

³ This implies giving up on some of the traditional assumptions of inequality aversion experiments such as veil of ignorance approaches (Costa-Font and Cowell, 2019).

exposure to the health or economic consequences of the pandemic in shaping these behaviours. A recent review of the effect of viral pandemics suggests that it is not clear from the literature that individuals become more tolerant and cooperative during a pandemic (Seitz et al, 2020). However, there is evidence that individuals who were more pro-social before the pandemic have engaged in several desirable health-related behaviours during the pandemic such as: physical distancing; following hygiene recommendations; informing themselves about how they can help others; and donating financial resources towards efforts to fight COVID-19 (Campos-Mercade et al, 2021).

This paper contributes to the literature in three ways: first, we elicit individual level health and income inequality aversion and its relation to health and employment shocks experienced during the first wave of the COVID-19 pandemic. Second, we estimate how individual level aversion to health and income inequality varies between three important European countries: Italy (the first European country to be exposed to COVID-19), Germany (a country revealing low initial levels of contagion) and the United Kingdom (a country with high levels of contagion and fatalities from COVID-19), and whether inequality aversion changes after health, income and employment shocks. Finally, we compare how inequality aversion in the United Kingdom has changed before and after the onset of the pandemic and examine how this change has varied between groups based on their vulnerability to COVID-19 according to different criteria such as age, region and exposure to health and income shocks.

The next section summarises the related literature. Section 3 describes the survey, elicitation strategy, and empirical specification. Section 4 reports the descriptive results for the 3 countries. Section 5 reports the results from regression analysis describing the impacts of health and employment shocks on health and inequality aversion conditional on controlling for key

confounding variables such as income, education, demographics and especially risk aversion. Section 6 reports the results from a range of difference-in-differences strategies where we compare the impact of exposure to COVID-19 on inequality aversion in different risk groups in the United Kingdom, and the final section concludes.

2. Related Literature

2.1 *Theoretical framework*

Aversion to inequality affects the welfare loss that a society experiences from living with health inequality. Let us assume that individuals care about their health or income (y) and health or income inequality (Φ) according to preferences given by the following type of utility function

$$u = h(y\Phi^{-\gamma}) \quad (1)$$

then γ is the inequality aversion parameter that we are interested in. In more concrete terms if we adopt the coefficient of variation as the inequality index Φ , then (1) can be written as

$$u = h\left(y\left(\frac{\bar{y}}{\sigma_y}\right)^\gamma\right) \quad (2)$$

where \bar{y} denotes average health status or income of the country, and σ_y is the standard deviation of health status, hence \bar{y}/σ_y refer to a measure of inequality, which individuals' trade-off with average health and income. The rest of the paper will be devoted to examining what we know about inequality aversion in the health and income domains, and to inequality trade-offs capturing how much individuals are willing to sacrifice of some utility enhancing goods such as income or health to reduce its dispersion (inequality). We elicit the impacts of geographical and age-based exposure to COVID-19 (and a combination of both) on inequality preferences in both income and health domains.

2.2 *Inequality aversion in income and health*

Studies eliciting direct measures of *income inequality* aversion differ in the instruments employed, and more generally estimates suggest significant heterogeneity when experimental methods are used. Leaky buckets experiments (examining the tolerance to transferring income from the rich to the poor) indicate values of inequality aversion close to zero (Amiel et al., 1999, Pirttila and Uusitalo, 2010). However, methods based on eliciting direct preferences over alternative income distributions, typically in larger samples, using different elicitation techniques such as the imaginary grandchild, suggest estimates that are ten times larger (Johansson-Stenman et al., 2002, Carlsson et al., 2005).

Studies eliciting *health inequality* aversion have not been studied as extensively as they have in the income domain. In the context of attitudes towards the distribution of organ transplants, Ubel and Loewenstein (1996) showed that individuals prefer an egalitarian equilibrium of giving everyone the chance of having a transplant rather than excluding those least likely to have a successful transplant. Leibler et al (2009) found that support for a Pigou-Dalton transfer from the better off to the worse off was stronger in the income as opposed to health domain. Consistent with these findings, Abásolo and Tsuchiya, (2018) employ survey evidence from Spain to compare losses in income and health from an ex-ante and an ex-post (or outcome) perspective and find that income inequality aversion is stronger than health inequality aversion. Finally, Hurley *et al* (2020) estimate income and health inequality aversion for a sample of the general public in Ontario using a publicly representative online survey and distinguish between bivariate inequality aversion and univariate inequality aversion and employing comparable instruments. They find evidence of *strong income inequality aversion and weaker aversion to health inequality and income-related health inequality*. However, these studies provide data from only single countries, do not attempt to examine changes over time, nor

explore the impacts of shocks such as the employment and health shocks associated with COVID-19 on inequality aversion. This paper will attempt to fill these gaps.

3. Data and Methods

3.1 Data

We commissioned surveys to collect data that are representative of the populations in the UK, Germany, and Italy. Sample sizes were 2,000 individuals in Italy and Germany, 1,000 for the UK in 2020, and 2,000 for the UK in 2016. The survey consisted of two groups of questions. The first group measured individual preferences for inequality in the health and income domains, and the second group of questions measured risk preferences as well as individual exposure to health, income and employment shocks experienced during the first wave of the COVID-19 pandemic. The survey prompt and response distribution of our questions is presented in the appendix.

This use of a panel of countries has significant advantages over the single country data used in previous studies. First, we estimate inequality aversion using survey evidence rather than attitudes alone: we capture the trade-off between health (income) and health (income) inequality (see appendix). Second, we identify risk exposure at the individual level and the country level. That is, our survey contains questions on exposure of COVID-19 in the family in the extended network (see appendix). Third, our survey instrument includes several relevant controls for income, personal characteristics and risk preferences which allow us to control for other determinants of inequality aversion. Fourth, our survey instrument has been implemented in three countries (the UK, Italy, and Germany) and pre- and post-COVID-19 for the United Kingdom.

3.2 *Methods*

We employ a simple discrete choice experiment question that elicits a consistent measure of inequality aversion at the individual level for both income and health, using an instrument that has already been piloted and tested in small samples. We attempt to contribute to both the literature on the measurement of income inequality, as well as the broader literature in social science that has focused on health inequality attitudes (Marmot et al. 2008, Lagomarsino et al. 2012). Despite substantial global policy concern about health inequality and universal health coverage (Marmot et al. 2012, Rodin and Ferranti 2012), individual aversion to health inequality has been much less intensively studied than individual aversion to income inequality and the two are rarely examined as distinct concepts (Abasalo and Tsuchiya 2013).

We commissioned a market research company (IPSOS-MORI) to carry out the survey in the three countries in 2020. The 2016 survey was commission to another market research company (ICM Unlimited) and it was fielded on the 29th - 31st January 2016 in the UK and included the same questions and controls with exactly the same wording. The key questions used to capture income and health inequality aversion are reproduced below:

- a. **Income inequality aversion:** *“Would you say that reducing income inequality (income differences) in Great Britain in 2016/ Great Britain in 2020/Italy/Germany] is more or less important than improving its total national income?”. Please read both statements and indicate your opinion on the following scale. The closer you place your answer to a statement the more it represents your opinion [Responses vary from 1 (Reducing income inequality is more important than improving total national income) to 10 (Improving total national income is more important than reducing income inequality) followed by don't know and prefer not to say].*

- b. **Health inequality aversion:** Would you say that reducing the inequality (or individual differences) in life expectancy in *in 2016/ Great Britain in 2020/Italy/Germany* is more or less important than improving average population life expectancy in Great Britain/Italy/Germany. Please read both statements and indicate your opinion on the following scale. The closer you place your answer to a statement the more it represents your opinion [*Responses vary from 1 (Reducing inequality in life expectancy is more important than improving average population life expectancy) to 10 (Improving average population life expectancy is more important than reducing inequality in life expectancy) followed by don't know and prefer not to say*].

3.3 Identification

Cross-sectional estimates. We draw on a wide-scale survey that elicits inequality aversion estimates and various determinants of inequality aversion preferences⁴. To date, we know little about the factors that explain changes in inequality aversion attitudes, although it is plausible that changes in health or economic conditions (such as experiences of hospitalisation, unemployment, residential mobility) are likely to affect the way that individuals view inequality, and their preferences across domains. Similarly, risk aversion may explain inequality preferences (Cowell and Schokkaert 2001). However, to date, most evidence comes from small-scale experiments that have limited external validity. We first examine the effect of a number of cross-sectional specifications across our three countries in 2020 of the form:

⁴ Examples of previous research drawing upon small-scale experiments include Amiel and Cowell (1999), Bolton and Ockenfels (2000), Bosmans and Schokkaert 2004, Carlsson et al. (2005), Cowell and Schokkaert (2001), Fehr and Schmidt (1999).

$$IA_i\{\text{Health, Income}\} = q_0 + q_1 \text{SHOCK}_i + q_2 \text{COUNTRY}_i + q_3 X_i + e_i \quad (3)$$

Where SHOCK_i refers to a specific health or income shock, q_2 captures country specific effects, and X_{it} captures the effects of income, education, risk preferences, demographics and more generally controls that can affect inequality preferences, both in the income and health domain. This will allow us to identify the effects of shocks in a household in the three European countries examined during 2020, in addition to the other effects identified by the literature.

Difference in differences estimates. Next, we examine the effects on inequality aversion of proximity to risk defined by age and regional risk, as well as the effects of personal health and financial shocks which were observed both in 2016 and in 2020. Finally, we examine the effect of changes in employment shocks in 2020 after the onset of the COVID-19 pandemic. Our empirical strategy allows us to identify the effect of the pandemic in 2020, as well as the effects of risk exposures drawing on a difference-in-differences (DiD) strategy comparing the effects of risk exposure and shocks in 2020 and 2016. To identify the causal effect of the COVID-19 pandemic, we develop measures that reflect COVID-19 mortality risk by age for the UK in 2020, then run a regression of the form:

$$IA_{it} \{\text{Health, Income}\} = a_0 + a_j \text{AGE}_{it} + a_2 D2020 + a_3 (\text{AGE}_{it} * D2020) + e_{it} \quad (4)$$

where i indexes individuals, t represents the year either 2016 or 2020, and j indexes age-groups. The coefficient vector a_3 picks up any changes in inequality aversion by AGE which captures the age patterning of exposure to COVID-19 risk. We also run similar models where we define COVID-19 risk in terms of region as below where the coefficient vector b_3 picks up any changes in inequality aversion relating to differential regional patterns of COVID-19 mortality rates:

$$IA_{it} \{Health, Income\} = b_0 + b_1REGION_{it} + b_2D2020 + b_3(REGION_{it}*D2020) + e_{it} \quad (5)$$

Next, we consider an age interaction treatment as follows:

$$IA_{it} \{Health, Income\} = c_0 + c_1REGION_{it} + c_2D2020 + c_3(REGION_{it} * D2020 * AGE_{it}) + c_4AGE + c_5(REGION_{it} * AGE_{it}) + e_{it} \quad (6)$$

Similarly, we run models examining the effect of experiencing health and financial shocks which we can observe in 2016 and 2020, where the coefficient vector d_3 would pick up changes in inequality aversion related to experiencing these shocks:

$$IA_{it} \{Health, Income\} = d_0 + d_1SHOCK_{it} + d_2D2020 + d_3(SHOCK_{it}*D2020) + e_{it} \quad (7)$$

Finally, we interact some of the above approaches to defining risk groups by combining personal exposure to income and health shocks with regional and age-based risk exposure as below:

$$IA_{it} \{Health, Income\} = g_0 + g_1REGION_{it} + g_2D2020 + g_3(REGION_{it} * D2020 * SHOCK_{it}) + g_4SHOCK_{it} + g_5(REGION_{it}*SHOCK_{it}) + e_{it} \quad (8)$$

and

$$IA_{it} \{Health, Income\} = h_0 + h_1AGE_{it} + h_2D2020 + h_3(AGE_{it} * D2020 * SHOCK_{it}) + h_4SHOCK_{it} + h_5(AGE_{it}*SHOCK_{it}) + e_{it} \quad (9)$$

We examine the robustness of our difference-in-differences results by running these specifications with and without our standard set of controls.

4. Results

4.1 *Descriptive evidence*

We report estimates of the average inequality aversion level by country in Table 1. We find *in all countries a higher inequality aversion to income than to health*, consistent with the findings of other studies conducted before COVID-19 (Costa-Font et al, 2019, Hurley et al, 2020). The difference across domains in 2020 is twice as large in Germany than in Italy and the UK. *Figure 1 reveals that Germans are on average the most inequality averse of the populations from the three countries in terms of income inequality.* Furthermore, Table 1 suggests that inequality aversion (IA) in the health domain is higher in the UK than in Italy or Germany, and that these differences are statistically significant (See Table A1 and A2 in the Appendix). The change in IA between 2016 and 2020 in the UK is twice as large for health than income, which suggests that COVID-19 may have exerted a stronger effect on health inequality aversion than on income inequality aversion in the UK.

When we compare estimates across age groups, reported in Table A3 and A3 in the appendix, we find the differences described above are primarily driven by older and middle age individuals. Income inequality aversion is larger amongst older and middle age people in Germany than the same groups in Italy and the UK, though there are no significant cross-country differences in health inequality aversion. There is little evidence to suggest any gender differences in inequality aversion

regardless of the domain (see Tables B1, B2 and B3). Figure A2 and A3 report graphical evidence of gender differences in inequality aversion for the UK between 2016 and 2020.

[Insert Table 1 and Figure 1 about here]

Figures 2 -5 provide graphical evidence of differences in health and income inequality aversion in the UK by age and income group. They suggest lower levels of inequality aversion among younger individuals and higher income respondents.

Table A4 provides the mean and standard deviations of the main variables in our analysis. 13% of the sample is under 25 and 12% is over 65 in the three countries examined. 49% are female, and 11% exhibit low education attainment, 32% are low income and 13% are extremely risk averse. 9% have undergone a minor health shock and 7.5%, a major one. Income shocks are more common, 28% have experience a minor income shock and 7% a major one. Finally, 48% have experienced a temporary employment shock and 5% a temporary one.

5. Regression evidence of Inequality aversion

5.1 Health Inequality Aversion

Table 2 provides a summary of the cross-country influences on health inequality aversion. We find a 37-percentage point (pp) lower health inequality aversion in Italy than in the UK, but no difference between the UK and Germany. Overall, the average health inequality aversion shows evidence of a concern for inequality with an intercept of about 6. We use the empirical evidence to examine the effect of gender, age, and risk aversion. Our estimates show lower inequality aversion among

individuals under 25 years of 43pp which remains significant and robust across different specifications, though the addition of other controls account for part of this effect, causing it to drop to 33pp. In contrast gender, although significant when a limited set of controls are included, is less robust to alternate model specifications and is no longer significant after differential health shocks are accounted for.

[Insert Table 2 about here]

Consistent with expectations (Amiel et al, 2001, Cowell and Schokkaert 2001), risk-loving individuals exhibit significantly lower inequality aversion, 1.23 points on the scale, consistent throughout the different specifications. Specification 4 adds the effect of education and income. Education increases inequality aversion by 35 percentage points (pp) and is consistent across different specifications. In contrast, the effect of income increases health inequality aversion for individuals with below-average income and reduces inequality aversion for above-average income individuals, by magnitudes of 23pp and -27pp, respectively. Next, specification 5 adds the effect of health shocks, both major and minor, and each reduces average health inequality aversion by -32pp. Specification 6 adds the effects of income shocks which do not appear to exert any significant impact on average health inequality aversion. Finally, employment shows an imprecise reduction in health inequality aversion (significant at 10% level).

[Insert Table 3 about here]

Table 3 reports the correlates of income inequality aversion consistent with Table 2. Compared to the UK, income inequality aversion is significantly higher in Germany, 49pp, and the estimates are robust across different specifications. Consistent with health inequality aversion, income inequality aversion is consistently lower among individuals under 25 (44pp), and higher among individuals over

65 (33pp). As with health inequality aversion, we find no evidence of gender effects either, although risk-loving individuals reveal significantly less inequality aversion 1.65 points. Income and education effects are consistent with previous estimates for health inequality aversion. We find that lower-income individuals are 21pp *more* inequality averse. In contrast, higher income individuals are 35pp less inequality averse. Next, when we examine the effect of health shocks, we find that major health shocks reduce income inequality aversion (-53pp). However, whilst income shocks do not modify inequality aversion estimates, permanent employment shocks do reduce income inequality aversion by 43pp.

6. Difference in differences (DiD) estimates

6.1 Health Inequality Aversion

Tables 4-7 report a range of difference-in-differences estimates for health inequality aversion in the UK between 2016 and 2020 where control groups are based on: (i) age specific risks groups; (ii) regional risk; (iii) health shocks, and (iv) income shocks. Table 4 reports the simple DiD estimates without controls, Table 5 reports the DiD estimates with risk group interactions, Table 6 reports simple DiD with controls, and finally Table 7 reports DiD with risk group interactions and controls. Estimates suggest no evidence of any of the simple DiD being significant as reported in Table 4. However, Table 5 reports a consistent 2.1 points increase in health inequality aversion amongst individuals that experienced a health shock in 2020 and were part of a high COVID-19 risk age group compared to individuals in a high-risk age group that exhibited a health shock in 2016. The effects remain significant once controls are included, see Table 7.

[Insert Table 4-7 about here]

6.2 *Income Inequality Aversion*

Tables 8-11 report a range of difference-in-differences estimates for income inequality aversion in the UK between 2016 and 2020 where control groups are based on: (i) age specific risks groups; (ii) regional risk; (iii) health shocks, and (iv) income shocks on health inequality aversion. Table 8 reports the simple DiD estimates without controls, Table 9 reports the DiD estimates with risk group interactions, Table 10 reports simple DiD with controls, and finally Table 11 reports DiD with risk group interactions and controls. Consistent with Table 4 for health inequality aversion, Table 8 reports no evidence of significant simple DiD effects. Also consistent with Table 5 for health inequality aversion, Table 9 reveals that when we compare individuals that experience a health shock in 2020 and were part of a high-risk age group with individuals in a high-risk age group that experienced a health shock in 2016, we find that they display a 1.8-point increase in income inequality aversion. This effect remains after including controls, see table 11.

[Insert Table 8-11 about here]

7. Conclusion

This study estimates individuals' inequality aversion using a direct trade-off measure in three countries differentially affected by COVID-19. For one country (United Kingdom) similar estimates are also produced for 2016 and are used to attempt to identify the impact of the pandemic on inequality aversion. We find the following. First, First, irrespective of the country and year, people are more inequality averse with respect to income than health. The difference across domains is twice as large in Germany than in Italy and the UK. Second, individuals in the UK were found to be more inequality averse in 2020 as compared to 2016, with the increase in inequality aversion twice as

large for health than income. We find a significant increase in inequality aversion from 2016 to 2020 in both health (17.3%) and income domains (8.8%). Third, being risk-loving, having a higher income or being younger are all found to be associated with significantly lower levels of inequality aversion. In contrast, we find that more education is associated with higher levels of inequality aversion. Fourth, individuals experiencing health or employment shocks during the COVID-19 pandemic tended to be significantly less averse to health and income inequality. This result is consistent with the effect of catastrophes in reducing empathy (Seitz et al, 2020). Finally, using a differences-in-difference model we find that in the UK, those individuals in high COVID-19 risk age groups who experienced a health shock during the pandemic displayed significantly increased levels of health and income inequality aversion than similar aged individuals experiencing a health shock in 2016.

Our estimates on the cross-country differences in inequality aversion can be explained by studies that suggest that individuals living in more unequal societies might be less concerned about reducing inequality, and in such societies, income having more of an effect on wellbeing (Machia et al, 2020). Individuals exhibit a higher inequality aversion with respect to income than health in each of the three countries examined. We find higher levels of inequality aversion for the UK in 2020 than in 2016, and find this increase to be twice as large in the health domain (0.9 increase) as compared to an average rate of 5.9, and about half the effect (0.45) in the income domain. Exposure to health shocks reduced inequality aversion by 0.35-0.6pp which is 7-10% reduction.

Our DiD estimates indicate that only individuals in the relevant risk age groups that at the same time went through a health shock in 2020 exhibit a significant increase in inequality aversion compared to similar individuals in 2016, and such effects were found to be large and significant for both income (1.966) and health inequality (2.135) aversion estimates. These effects may be explained by the

salience of health shocks among individuals who are more exposed to the risks of the pandemic, as well as potential direct experience with potential life threatening effects of COVID-19 in the households facing a health shock at old age compared to similar health shock in 2016, which might be less likely to result from a communicable disease.

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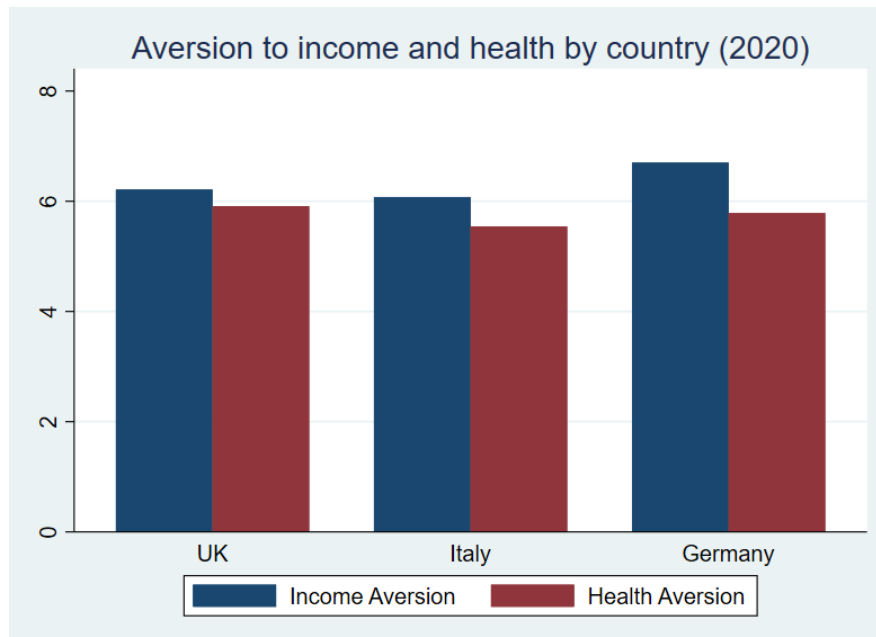
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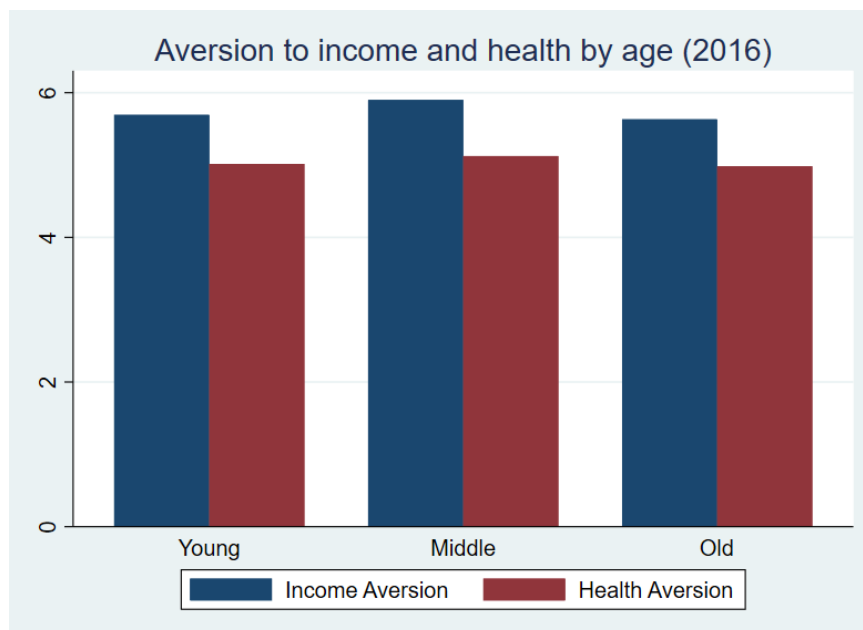
Tables and Figures

Figure 1. Cross-country Income and Health Inequality Aversion in 2020



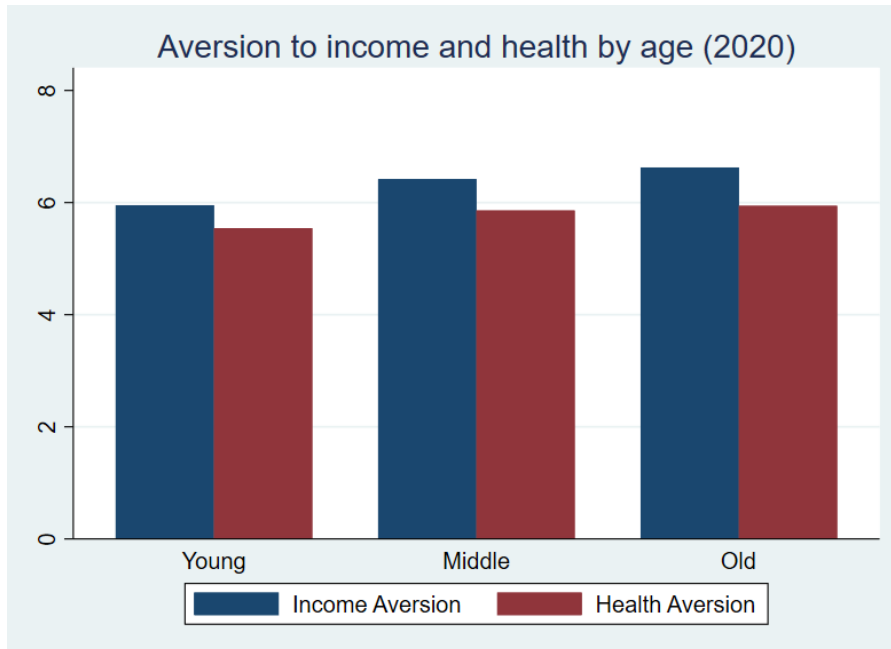
Note: we plot the mean estimates of income and health inequality aversion in the 2020 covering Italy, Germany and the UK.

Figure 2. Age Differences in health Inequality aversion in 2016



Note: we plot the mean estimates of income and health inequality aversion in the 2016 in the UK across age groups.

Figure 3. Age Differences in health Inequality aversion in 2020



Note: we plot the mean estimates of income and health inequality aversion in the 2020 in the UK across age groups.

Figure 4. Income and Health Inequality aversion by income group 2016

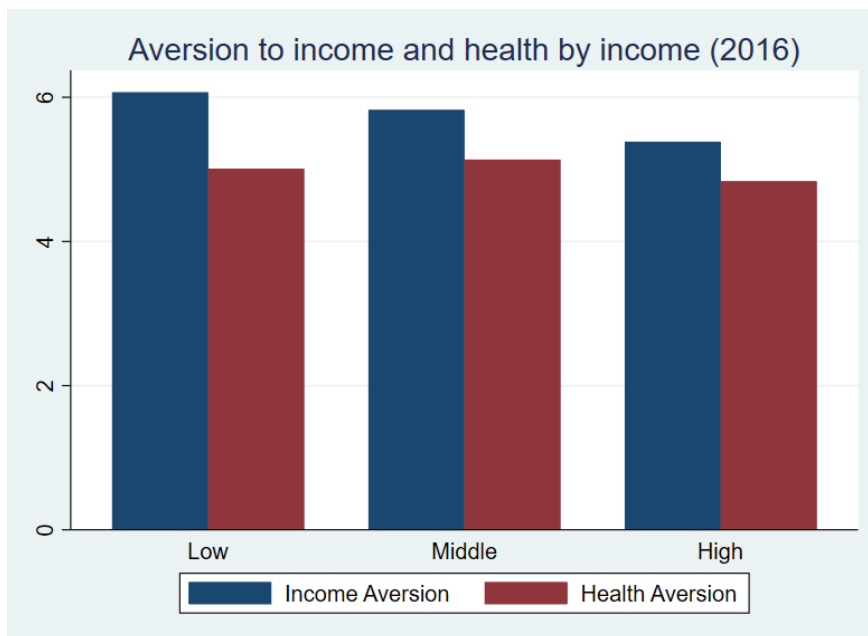


Figure 5. Income and Health Inequality aversion by income group 2020

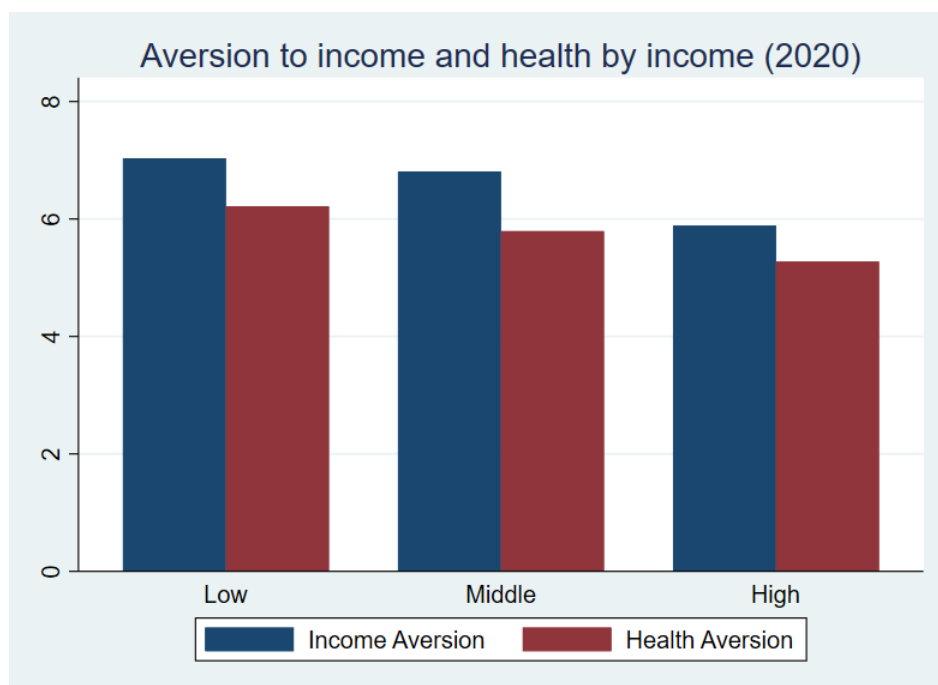


Table 1. Inequality aversion across domains(income/health), countries (UK, Germany and Italy) and years (2020, 2016)

	2016		2020		Equality across domains - 2016	Equality across domains – 2020	Equality across years - Income	Equality across years – Health
Country (Obs)	IA Income	IA Health	IA Income	IA Health	t-value (domain)	t-value (domain)	t-value (year)	t-value (years)
United Kingdom (1930))	5.75	5.06	6.25	5.94	13.6	-	5.65	10.75
United Kingdom (1801)	-	-	6.25	5.94	-	5.45	-	-
Italy (1732)	-	-	6.06	5.58	-	8.3	-	-
Germany (859)	-	-	6.67	5.80	-	9.3	-	-

Note: This table reports the number of observations and mean value of inequality aversion in the income and health domains in three countries under examination in 2020 and in 2016 for the UK and undertakes a test of equality of mean values across domains

Table 2 Health inequality aversion - 2020

	(1) Health Inequality Aversion	(2) Health Inequality Aversion	(3) Health Inequality Aversion	(4) Health Inequality Aversion	(5) Health Inequality Aversion	(6) Health Inequality Aversion	(7) Health Inequality Aversion	(8) Health Inequality Aversion	(9) Health Inequality Aversion
Age group (reference: 25-64)									
<25		-0.432*** (0.112)	-0.386*** (0.112)	-0.407*** (0.120)	-0.341*** (0.124)	-0.380*** (0.122)	-0.355*** (0.123)	-0.335*** (0.125)	-0.326*** (0.126)
65+		0.197* (0.117)	0.162 (0.117)	0.165 (0.124)	0.156 (0.125)	0.176 (0.125)	0.134 (0.126)	0.132 (0.127)	0.134 (0.128)
Gender (reference: female)									
Male		-0.183** (0.0760)	-0.155** (0.0760)	-0.140* (0.0804)	-0.123 (0.0811)	-0.127 (0.0812)	-0.154* (0.0812)	-0.137* (0.0819)	-0.134 (0.0823)
Education level (reference: medium)									
low education				-0.159 (0.144)	-0.188 (0.146)	-0.159 (0.146)	-0.144 (0.145)	-0.188 (0.147)	-0.175 (0.148)
high education				0.346*** (0.0880)	0.348*** (0.0888)	0.351*** (0.0888)	0.339*** (0.0887)	0.339*** (0.0894)	0.336*** (0.0897)
Income level (reference: medium)									
low income				0.237** (0.0932)	0.232** (0.0943)	0.230** (0.0943)	0.235** (0.0943)	0.238** (0.0952)	0.229** (0.0959)
high income				-0.277** (0.108)	-0.303*** (0.109)	-0.291*** (0.109)	-0.298*** (0.109)	-0.311*** (0.110)	-0.300*** (0.110)
Risk attitude (reference: moderate)									
extremely risk loving			-1.234***	-1.214***	-1.200***	-1.242***	-1.240***	-1.224***	-1.245***

			(0.191)	(0.197)	(0.200)	(0.200)	(0.199)	(0.201)	(0.202)	
	extremely risk averse		0.161	0.126	0.106	0.129	0.109	0.106	0.101	
			(0.136)	(0.146)	(0.148)	(0.148)	(0.147)	(0.149)	(0.150)	
Country (reference: UK)										
	Italy	-0.370***	-0.364***	-0.345***	-0.315***	-0.309***	-0.310***	-0.298***	-0.306***	-0.312***
		(0.0848)	(0.0854)	(0.0851)	(0.0909)	(0.0918)	(0.0921)	(0.0920)	(0.0927)	(0.0932)
	Germany	-0.128	-0.139	-0.163	-0.142	-0.141	-0.121	-0.133	-0.132	-0.124
		(0.104)	(0.104)	(0.104)	(0.112)	(0.113)	(0.113)	(0.113)	(0.114)	(0.115)
Health shock (reference: none)										
	Minor health shock					-0.330**		-0.309**	-0.325**	
						(0.137)		(0.139)	(0.140)	
	Major health shock					-0.323**		-0.318**	-0.324**	
						(0.151)		(0.154)	(0.156)	
Income shock (reference: none)										
	Minor income shock						0.0683		0.226	
							(0.0950)		(0.123)	
	Major income shock						0.0109		0.195	
							(0.106)		(0.139)	
Employment shock (reference: none)										
	Temporary employment shock						-0.115	-0.0827	-0.231*	
							(0.0855)	(0.0873)	(0.119)	
	Permanent employment shock						-0.0422	0.0282	-0.133	
							(0.178)	(0.180)	(0.205)	
Constant		5.912***	6.036***	6.054***	5.899***	5.952***	5.867***	5.964***	5.998***	5.975***
		(0.0592)	(0.0752)	(0.0764)	(0.101)	(0.103)	(0.110)	(0.114)	(0.115)	(0.116)
Observations		4,598	4,583	4,583	4,148	4,080	4,088	4,087	4,032	4,009
R-squared		0.004	0.009	0.019	0.027	0.030	0.027	0.028	0.030	0.031

Note: This table examines a number of correlates of health inequality aversion in Italy, Germany, and the UK. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3: Income inequality aversion 2020

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion
Age group (reference: 25-64)									
<25		-0.445***	-0.382***	-0.454***	-0.338***	-0.433***	-0.388***	-0.313**	-0.315**
		(0.115)	(0.115)	(0.124)	(0.127)	(0.126)	(0.126)	(0.129)	(0.130)
65+		0.335***	0.298**	0.256**	0.253**	0.237*	0.214*	0.228*	0.218*
		(0.119)	(0.118)	(0.125)	(0.126)	(0.127)	(0.128)	(0.128)	(0.129)

Gender (reference: female)									
Male	-0.124	-0.0957	-0.0832	-0.0750	-0.0776	-0.0749	-0.0676	-0.0727	
	(0.0774)	(0.0771)	(0.0815)	(0.0820)	(0.0822)	(0.0822)	(0.0827)	(0.0830)	
Education level (reference: medium)									
low education			-0.177	-0.203	-0.195	-0.179	-0.213	-0.218	
			(0.145)	(0.147)	(0.147)	(0.146)	(0.148)	(0.149)	
high education			0.212**	0.242***	0.221**	0.213**	0.243***	0.238***	
			(0.0894)	(0.0900)	(0.0901)	(0.0900)	(0.0906)	(0.0909)	
Income level (reference: medium)									
low income			0.225**	0.217**	0.230**	0.229**	0.221**	0.217**	
			(0.0947)	(0.0954)	(0.0958)	(0.0956)	(0.0963)	(0.0971)	
high income			-0.348***	-0.353***	-0.349***	-0.373***	-0.367***	-0.356***	
			(0.110)	(0.110)	(0.111)	(0.111)	(0.111)	(0.112)	
Risk attitude (reference: moderate)									
extremely risk loving		-1.645***	-1.552***	-1.475***	-1.510***	-1.557***	-1.478***	-1.484***	
		(0.197)	(0.202)	(0.205)	(0.206)	(0.204)	(0.207)	(0.208)	
extremely risk averse		0.158	0.193	0.204	0.188	0.171	0.190	0.196	
		(0.135)	(0.145)	(0.146)	(0.147)	(0.147)	(0.148)	(0.149)	
Country (reference: UK)									
Italy	-0.136	-0.121	-0.0883	-0.00990	0.00931	-0.00104	0.0212	0.0224	0.00874
	(0.0867)	(0.0872)	(0.0867)	(0.0924)	(0.0931)	(0.0937)	(0.0934)	(0.0939)	(0.0945)
Germany	0.489***	0.465***	0.436***	0.420***	0.442***	0.436***	0.429***	0.451***	0.461***
	(0.105)	(0.105)	(0.104)	(0.113)	(0.114)	(0.114)	(0.114)	(0.115)	(0.115)
Health shock (reference: none)									
Minor health shock					-0.256*		-0.227	-0.234	
					(0.140)		(0.142)	(0.143)	
Major health shock					-0.533***		-0.506***	-0.501***	
					(0.156)		(0.159)	(0.161)	
Income shock (reference: none)									
Minor income shock						0.0561			0.207*
						(0.0960)			(0.123)
Major income shock						-0.0677			0.182
						(0.108)			(0.140)
Employment shock (reference: none)									
Temporary employment shock							-0.126	-0.0640	-0.201*
							(0.0865)	(0.0881)	(0.119)
Permanent employment shock							-0.419**	-0.312*	-0.435**
							(0.181)	(0.183)	(0.207)
Constant	6.212***	6.289***	6.316***	6.230***	6.262***	6.217***	6.304***	6.300***	6.284***
	(0.0604)	(0.0766)	(0.0776)	(0.102)	(0.104)	(0.111)	(0.115)	(0.116)	(0.116)

Observations	4,811	4,796	4,796	4,330	4,266	4,271	4,269	4,216	4,192
R-squared	0.007	0.013	0.028	0.034	0.036	0.032	0.035	0.037	0.038

Note: This table examines a number of correlates of income inequality aversion in Italy, Germany, and the UK. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 4: Health inequality aversion difference in differences no controls single risk variable UK 2016 / 2020

	(1) Health Inequality Aversion	(2) Health Inequality Aversion	(3) Health Inequality Aversion	(4) Health Inequality Aversion	(5) Health Inequality Aversion	(6) Health Inequality Aversion
Year = 2020	0.904*** (0.102)	0.839*** (0.0885)	0.895*** (0.0838)	0.904*** (0.0901)	0.838*** (0.0862)	0.764*** (0.0994)
High regional risk	0.149 (0.117)					
2020#High regional risk	-0.110 (0.166)					
High age-based risk		-0.0813 (0.140)				
2020 * High age based risk		0.145 (0.215)				
Serious health shock			-0.204 (0.194)			
2020 * Serious health shock			-0.474 (0.294)			
Minor or serious health shock				-0.195 (0.131)		
2020 * Minor or serious health shock				-0.335* (0.202)		
Serious income shock					0.118 (0.248)	
2020 * Serious income shock					0.0520 (0.287)	
Minor or serious income shock						-0.00506 (0.151)
2020 * Minor or serious income shock						0.223 (0.190)
Constant	4.993*** (0.0708)	5.064*** (0.0633)	5.066*** (0.0592)	5.095*** (0.0649)	5.041*** (0.0580)	5.048*** (0.0618)
Observations	3,846	3,846	3,846	3,846	3,846	3,846
R-squared	0.030	0.029	0.032	0.033	0.030	0.030

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Health inequality aversion difference in differences no controls multiple risk variables UK 2016 / 2020

	(1) Health Inequality Aversion	(2) Health Inequality Aversion	(3) Health Inequality Aversion	(4) Health Inequality Aversion	(5) Health Inequality Aversion	(6) Health Inequality Aversion	(7) Health Inequality Aversion	(8) Health Inequality Aversion
Year = 2020	0.894*** (0.0827)	0.842*** (0.0809)	0.847*** (0.0806)	0.874*** (0.0817)	0.849*** (0.0828)	0.896*** (0.0812)	0.859*** (0.0805)	0.857*** (0.0804)
High regional and age risk	0.523** (0.236)							
2020 * High regional and age risk	-0.464 (0.356)							
Health shock and high age risk		-0.426 (0.425)						
2020 * Health shock and high age risk		2.154*** (0.756)						
Income shock and high age risk			-0.716 (1.018)					
2020 * Income shock and high age risk			2.105* (1.156)					
Health shock and high regional risk				-0.466 (0.310)				
2020 * Health shock and high regional risk				-0.296 (0.445)				
Income shock and high regional risk					-0.173 (0.393)			
2020 * Income shock and high regional risk					0.316 (0.443)			
Income shock and health shock						-0.757* (0.437)		
2020 * Income shock and health shock						-0.626 (0.543)		
Health shock and high regional and age risk							0.329 (0.883)	
2020 * Health shock and high regional and age risk							1.266 (1.249)	
Income shock and high regional and age risk								0.954 (1.762)
2020 * Income shock and high regional and age risk								1.429 (1.999)
Constant	5.015*** (0.0582)	5.055*** (0.0569)	5.049*** (0.0565)	5.063*** (0.0574)	5.051*** (0.0570)	5.060*** (0.0568)	5.046*** (0.0565)	5.046*** (0.0564)

Observations	3,846	3,846	3,846	3,846	3,846	3,846	3,846	3,846
R-squared	0.030	0.031	0.031	0.031	0.029	0.035	0.030	0.031
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1								

Table 6: Health inequality aversion difference in differences with controls single risk variable UK 2016 / 2020

	(1) Health Inequality Aversion	(2) Health Inequality Aversion	(3) Health Inequality Aversion	(4) Health Inequality Aversion	(5) Health Inequality Aversion	(6) Health Inequality Aversion
Age group (reference: 25-64)						
<25	-0.437*** (0.128)	-0.431*** (0.129)	-0.394*** (0.129)	-0.391*** (0.129)	-0.442*** (0.129)	-0.453*** (0.129)
65+	-0.0825 (0.115)	-0.141 (0.151)	-0.0894 (0.114)	-0.0913 (0.114)	-0.0810 (0.115)	-0.0764 (0.116)
Gender (reference: female)						
Male	-0.0599 (0.0847)	-0.0551 (0.0848)	-0.0518 (0.0847)	-0.0491 (0.0847)	-0.0601 (0.0849)	-0.0586 (0.0847)
Education level (reference: medium)						
low education	-0.132 (0.214)	-0.137 (0.215)	-0.121 (0.214)	-0.0998 (0.214)	-0.117 (0.214)	-0.116 (0.214)
high education	0.487*** (0.0880)	0.489*** (0.0880)	0.486*** (0.0879)	0.492*** (0.0879)	0.490*** (0.0880)	0.495*** (0.0880)
Income level (reference: medium)						
low income	0.0200 (0.107)	0.0205 (0.107)	0.0138 (0.107)	0.0194 (0.107)	0.0213 (0.107)	0.0333 (0.107)
high income	-0.397*** (0.102)	-0.395*** (0.102)	-0.391*** (0.102)	-0.388*** (0.102)	-0.390*** (0.102)	-0.389*** (0.102)
Risk attitude (reference: moderate)						
extremely risk loving	-1.213*** (0.219)	-1.202*** (0.219)	-1.192*** (0.219)	-1.167*** (0.219)	-1.211*** (0.219)	-1.196*** (0.219)
extremely risk averse	-0.0247 (0.147)	-0.0269 (0.147)	-0.0228 (0.147)	-0.0249 (0.147)	-0.0241 (0.147)	-0.0160 (0.147)
Year = 2020	0.965*** (0.107)	0.889*** (0.0928)	0.936*** (0.0885)	0.933*** (0.0949)	0.892*** (0.0908)	0.792*** (0.104)
High regional risk	0.204* (0.123)					
2020 * High regional risk	-0.156 (0.173)					
2020 * High age-based risk (65+)		0.116 (0.227)				

Serious health shock			-0.113 (0.204)				
2020 * Serious health shock			-0.422 (0.303)				
Minor or serious health shock				-0.168 (0.137)			
2020 * Minor or serious health shock				-0.248 (0.209)			
Serious income shock					0.121 (0.255)		
2020 * Serious income shock					0.00390 (0.295)		
Minor or serious income shock						-0.0387 (0.159)	
2020 * Minor or serious income shock						0.279 (0.198)	
Constant	4.956*** (0.105)	5.037*** (0.0983)	5.033*** (0.0981)	5.057*** (0.102)	5.019*** (0.0980)	5.026*** (0.101)	
Observations	3,521	3,521	3,521	3,521	3,521	3,521	
R-squared	0.054	0.054	0.055	0.056	0.054	0.055	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Health inequality aversion difference in differences with controls multiple risk variables UK 2016 / 2020

	(1) Health Inequality Aversion	(2) Health Inequality Aversion	(3) Health Inequality Aversion	(4) Health Inequality Aversion	(5) Health Inequality Aversion	(6) Health Inequality Aversion	(7) Health Inequality Aversion	(8) Health Inequality Aversion
Age group (reference: 25-64)								
<25	-0.438*** (0.128)	-0.430*** (0.128)	-0.431*** (0.128)	-0.404*** (0.129)	-0.436*** (0.129)	-0.370*** (0.129)	-0.433*** (0.128)	-0.435*** (0.128)
65+	-0.248* (0.134)	-0.132 (0.118)	-0.131 (0.116)	-0.0908 (0.115)	-0.0904 (0.115)	-0.110 (0.114)	-0.124 (0.115)	-0.115 (0.115)
Gender (reference: female)								
Male	-0.0604 (0.0847)	-0.0565 (0.0846)	-0.0618 (0.0847)	-0.0529 (0.0847)	-0.0578 (0.0848)	-0.0484 (0.0845)	-0.0576 (0.0847)	-0.0584 (0.0847)
Education level (reference: medium)								
low education	-0.130 (0.214)	-0.150 (0.214)	-0.134 (0.214)	-0.109 (0.214)	-0.126 (0.214)	-0.127 (0.213)	-0.160 (0.214)	-0.120 (0.214)
high education	0.494*** (0.0879)	0.491*** (0.0879)	0.491*** (0.0879)	0.490*** (0.0880)	0.489*** (0.0880)	0.478*** (0.0878)	0.489*** (0.0879)	0.486*** (0.0880)
Income level (reference: medium)								
low income	0.0259	0.0285	0.0192	0.0154	0.0230	0.0166	0.0365	0.0161

high income	(0.107) -0.393*** (0.102)	(0.107) -0.394*** (0.102)	(0.107) -0.398*** (0.102)	(0.107) -0.390*** (0.102)	(0.107) -0.393*** (0.102)	(0.107) -0.399*** (0.102)	(0.107) -0.390*** (0.102)	(0.107) -0.398*** (0.102)
Risk attitude (reference: moderate)								
extremely risk loving	-1.202*** (0.219)	-1.213*** (0.219)	-1.207*** (0.219)	-1.204*** (0.219)	-1.204*** (0.220)	-1.163*** (0.219)	-1.199*** (0.219)	-1.199*** (0.219)
extremely risk averse	-0.0171 (0.147)	-0.0389 (0.147)	-0.0157 (0.147)	-0.0240 (0.147)	-0.0254 (0.147)	-0.0275 (0.146)	-0.0290 (0.147)	-0.0273 (0.147)
Year = 2020	0.933*** (0.0873)	0.884*** (0.0854)	0.889*** (0.0853)	0.921*** (0.0865)	0.906*** (0.0874)	0.932*** (0.0858)	0.901*** (0.0852)	0.901*** (0.0851)
High regional and age risk	0.736*** (0.275)							
2020 * High regional and age risk	-0.528 (0.370)							
Health shock and high age risk		-0.243 (0.472)						
2020 * Health shock and high age risk		2.135*** (0.774)						
Income shock and high age risk			-0.881 (1.111)					
2020 * Income shock and high age risk			2.378* (1.252)					
Health shock and high regional risk				-0.240 (0.326)				
2020 * Health shock and high regional risk				-0.431 (0.457)				
Income shock and high regional risk					0.0291 (0.399)			
2020 * Income shock and high regional risk					0.00608 (0.450)			
Income shock and health shock						-0.873* (0.464)		
2020 * Income shock and health shock						-0.453 (0.568)		
Health shock and high regional and age risk							1.015 (1.017)	
2020 * Health shock and high regional and age risk							0.677 (1.337)	
Income shock and high regional and age risk								1.063 (2.474)
2020 * Income shock and high regional and age risk								0.959 (2.671)
Constant	5.013***	5.039***	5.040***	5.030***	5.027***	5.042***	5.028***	5.036***

	(0.0967)	(0.0963)	(0.0964)	(0.0967)	(0.0968)	(0.0964)	(0.0964)	(0.0964)
Observations	3,521	3,521	3,521	3,521	3,521	3,521	3,521	3,521
R-squared	0.055	0.056	0.055	0.055	0.054	0.059	0.055	0.055

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Income inequality aversion difference in differences no controls single risk variable UK 2016 / 2020

	(1) Income Inequality Aversion	(2) Income Inequality Aversion	(3) Income Inequality Aversion	(4) Income Inequality Aversion	(5) Income Inequality Aversion	(6) Income Inequality Aversion
Year = 2020	0.412*** (0.103)	0.412*** (0.0898)	0.470*** (0.0849)	0.469*** (0.0912)	0.461*** (0.0872)	0.399*** (0.100)
High regional risk	-0.00238 (0.120)					
2020 * High regional risk	0.122 (0.169)					
High age based risk		-0.154 (0.143)				
2020 * High age based risk		0.251 (0.216)				
Serious health shock			-0.320 (0.198)			
2020 * Serious health shock			-0.293 (0.302)			
Minor or serious health shock				-0.299** (0.134)		
2020 * Minor or serious health shock				-0.236 (0.206)		
Serious income shock					0.0428 (0.254)	
2020 * Serious income shock					-0.0416 (0.293)	
Minor or serious income shock						-0.0398 (0.155)
2020 * Minor or serious income shock						0.154 (0.193)
Constant	5.755*** (0.0725)	5.786*** (0.0649)	5.784*** (0.0607)	5.828*** (0.0665)	5.752*** (0.0595)	5.761*** (0.0634)

Observations	3,916	3,916	3,916	3,916	3,916	3,916
R-squared	0.008	0.008	0.011	0.012	0.008	0.008

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Income inequality aversion difference in differences no controls multiple risk variables UK 2016 / 2020

	(1) Income Inequality Aversion	(2) Income Inequality Aversion	(3) Income Inequality Aversion	(4) Income Inequality Aversion	(5) Income Inequality Aversion	(6) Income Inequality Aversion	(7) Income Inequality Aversion	(8) Income Inequality Aversion
Year = 2020	0.457*** (0.0838)	0.436*** (0.0820)	0.454*** (0.0818)	0.455*** (0.0828)	0.449*** (0.0838)	0.480*** (0.0823)	0.449*** (0.0816)	0.457*** (0.0816)
High regional and age risk	0.146 (0.241)							
2020 * High regional and age risk	0.0647 (0.359)							
Health shock and high age risk		-0.689* (0.417)						
2020 * Health shock and high age risk		1.798** (0.764)						
Income shock and high age risk			-0.589 (1.042)					
2020 * Income shock and high age risk			0.770 (1.171)					
Health shock and high regional risk				-0.751** (0.314)				
2020 * Health shock and high regional risk				0.0469 (0.451)				
Income shock and high regional risk					-0.521 (0.402)			
2020 * Income shock and high regional risk					0.499 (0.451)			
Income shock and health shock						-0.582 (0.447)		
2020 * Income shock and health shock						-0.432 (0.556)		
Health shock and high regional and age risk							-1.160 (0.808)	
2020 * Health shock and high regional and age risk							1.951 (1.211)	
Income shock and high regional and age risk								-0.755

2020 * Income shock and high regional and age risk								(1.803)
								0.828
Constant	5.745***	5.767***	5.756***	5.780***	5.765***	5.764***	5.760***	(2.045)
	(0.0597)	(0.0584)	(0.0579)	(0.0588)	(0.0584)	(0.0582)	(0.0580)	5.755***
Observations	3,916	3,916	3,916	3,916	3,916	3,916	3,916	3,916
R-squared	0.008	0.009	0.008	0.011	0.008	0.011	0.009	0.008

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Income inequality aversion difference in differences with controls single risk variable UK 2016 / 2020

	(1) Income Inequality Aversion	(2) Income Inequality Aversion	(3) Income Inequality Aversion	(4) Income Inequality Aversion	(5) Income Inequality Aversion	(6) Income Inequality Aversion
Age group (reference: 25-64)						
<25	-0.405*** (0.131)	-0.387*** (0.131)	-0.361*** (0.132)	-0.351*** (0.132)	-0.394*** (0.131)	-0.402*** (0.131)
65+	-0.128 (0.115)	-0.193 (0.153)	-0.128 (0.115)	-0.130 (0.115)	-0.125 (0.116)	-0.121 (0.116)
Gender (reference: female)						
Male	-0.165* (0.0854)	-0.160* (0.0855)	-0.161* (0.0853)	-0.157* (0.0853)	-0.163* (0.0855)	-0.165* (0.0853)
Education level (reference: medium)						
low education	-0.0745 (0.217)	-0.0915 (0.218)	-0.0589 (0.217)	-0.0445 (0.217)	-0.0756 (0.217)	-0.0710 (0.217)
high education	0.445*** (0.0886)	0.446*** (0.0886)	0.446*** (0.0886)	0.454*** (0.0885)	0.448*** (0.0887)	0.450*** (0.0886)
Income level (reference: medium)						
low income	0.176 (0.108)	0.167 (0.108)	0.159 (0.108)	0.165 (0.108)	0.169 (0.108)	0.177 (0.108)
high income	-0.458*** (0.103)	-0.462*** (0.103)	-0.460*** (0.103)	-0.457*** (0.103)	-0.459*** (0.103)	-0.457*** (0.103)
Risk attitude (reference: moderate)						
extremely risk loving	-1.775*** (0.225)	-1.772*** (0.224)	-1.755*** (0.224)	-1.727*** (0.225)	-1.777*** (0.225)	-1.764*** (0.225)
extremely risk averse	0.229 (0.148)	0.224 (0.148)	0.225 (0.148)	0.217 (0.148)	0.226 (0.148)	0.231 (0.149)
Year = 2020	0.393***	0.434***	0.460***	0.430***	0.456***	0.371***

	(0.107)	(0.0936)	(0.0890)	(0.0954)	(0.0913)	(0.105)
High regional risk	0.00677					
	(0.125)					
2020 * High regional risk	0.175					
	(0.174)					
2020 * High age based risk (65+)		0.143				
		(0.227)				
Serious health shock			-0.305			
			(0.207)			
2020 * Serious health shock			-0.144			
			(0.311)			
Minor or serious health shock				-0.348**		
				(0.139)		
2020 * Minor or serious health shock				-0.0292		
				(0.213)		
Serious income shock					0.0836	
					(0.260)	
2020 * Serious income shock					-0.0463	
					(0.299)	
Minor or serious income shock						-0.0574
						(0.162)
2020 * Minor or serious income shock						0.225
						(0.200)
Constant	5.794***	5.809***	5.821***	5.871***	5.790***	5.801***
	(0.107)	(0.0997)	(0.0993)	(0.103)	(0.0993)	(0.103)
Observations	3,592	3,592	3,592	3,592	3,592	3,592
R-squared	0.043	0.043	0.044	0.046	0.043	0.043

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Income inequality aversion difference in differences with controls multiple risk variables UK 2016 / 2020

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion	Income Inequality Aversion
Age group (reference: 25-64)								
<25	-0.390***	-0.387***	-0.391***	-0.362***	-0.391***	-0.355***	-0.391***	-0.392***
	(0.131)	(0.131)	(0.131)	(0.132)	(0.131)	(0.132)	(0.131)	(0.131)
65+	-0.230*	-0.132	-0.127	-0.133	-0.134	-0.143	-0.131	-0.122
	(0.134)	(0.119)	(0.117)	(0.115)	(0.115)	(0.115)	(0.116)	(0.116)
Gender (reference: female)								

Male	-0.163*	-0.160*	-0.164*	-0.159*	-0.165*	-0.158*	-0.162*	-0.165*
	(0.0854)	(0.0853)	(0.0854)	(0.0853)	(0.0855)	(0.0853)	(0.0853)	(0.0854)
Education level (reference: medium)								
low education	-0.0891	-0.0906	-0.0812	-0.0432	-0.0778	-0.0684	-0.0762	-0.0810
	(0.217)	(0.217)	(0.217)	(0.217)	(0.217)	(0.217)	(0.217)	(0.217)
high education	0.449***	0.451***	0.445***	0.451***	0.447***	0.442***	0.449***	0.447***
	(0.0886)	(0.0885)	(0.0886)	(0.0885)	(0.0887)	(0.0885)	(0.0886)	(0.0886)
Income level (reference: medium)								
low income	0.171	0.169	0.169	0.166	0.176	0.163	0.171	0.174
	(0.108)	(0.108)	(0.108)	(0.108)	(0.108)	(0.108)	(0.108)	(0.108)
high income	-0.461***	-0.462***	-0.461***	-0.458***	-0.460***	-0.464***	-0.463***	-0.458***
	(0.103)	(0.103)	(0.103)	(0.103)	(0.103)	(0.103)	(0.103)	(0.103)
Risk attitude (reference: moderate)								
extremely risk loving	-1.772***	-1.782***	-1.772***	-1.766***	-1.754***	-1.744***	-1.772***	-1.772***
	(0.224)	(0.224)	(0.225)	(0.224)	(0.226)	(0.225)	(0.224)	(0.225)
extremely risk averse	0.232	0.221	0.230	0.223	0.225	0.224	0.221	0.222
	(0.148)	(0.148)	(0.149)	(0.148)	(0.148)	(0.148)	(0.148)	(0.148)
Year = 2020	0.454***	0.435***	0.454***	0.446***	0.451***	0.474***	0.449***	0.458***
	(0.0879)	(0.0860)	(0.0859)	(0.0870)	(0.0879)	(0.0865)	(0.0858)	(0.0857)
High regional and age risk	0.293							
	(0.278)							
2020 * High regional and age risk	0.0474							
	(0.372)							
Health shock and high age risk		-0.665						
		(0.466)						
2020 * Health shock and high age risk		1.966**						
		(0.779)						
Income shock and high age risk			-0.932					
			(1.132)					
2020 * Income shock and high age risk			1.077					
			(1.263)					
Health shock and high regional risk				-0.744**				
				(0.326)				
2020 * Health shock and high regional risk				0.238				
				(0.461)				
Income shock and high regional risk					-0.327			
					(0.406)			
2020 * Income shock and high regional risk					0.320			
					(0.457)			
Income shock and health shock						-0.568		
						(0.473)		
2020 * Income shock and health shock						-0.304		
						(0.579)		
Health shock and high regional and age risk							-0.968	

2020 * Health shock and high regional and age risk							(0.898) 1.925	
Income shock and high regional and age risk							(1.261)	-2.848 (2.520)
2020 * Income shock and high regional and age risk								2.598
Constant	5.797*** (0.0980)	5.806*** (0.0976)	5.799*** (0.0977)	5.816*** (0.0979)	5.803*** (0.0980)	5.806*** (0.0977)	5.800*** (0.0976)	(2.721) 5.796*** (0.0976)
Observations	3,592	3,592	3,592	3,592	3,592	3,592	3,592	3,592
R-squared	0.043	0.044	0.043	0.045	0.043	0.045	0.043	0.043

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix A

Table A1. Cross country differences in inequality aversion estimates

Income Inequality Aversion (Country 1- Country 2)	# Observations Country 1	# Observations Country 2	Mean Country 1	Mean Country 1	Diff	t value
Italy - UK	1865	973	6.076	6.701	.625*** (.106)	-5.9
Germany - UK	1973	973	6.213	6.701	.488*** (.104)	-4.7
Germany - Italy	1973	1865	6.213	6.076	.136 (.087)	1.55
Health Inequality Aversion (Country 1- Country 2)	# Observations Country 1	# Observations Country 2	Mean Country 1	Mean Country 1	Dif	t value
Italy - UK	1799	904	5.542	5.785	-.243** (.104)	-2.3
Germany - UK	1895	904	5.912	5.785	.128 (.103)	1.25
Germany - Italy	1895	1799	5.912	5.542	.37*** (.086)	4.35

Note : the table reports the number of observations and mean value of inequality aversion in the income and health domains in three countries under examination and undertakes a cross-country test of equality of means. Standard errors in parentheses

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

Table A2. Within country Age differences in inequality aversion

	Obs (A)	Obs (B)	Mean (A)	Mean (B)	Age t value
Income IA – Germany					
A=Middle – B=Older Age	464	159	6.796	7.453	-2.9**
A=Young – B=Older Age	350	159	6.234	7.453	-4.85***
A= Young– B=Middle Age	350	464	6.234	6.796	-3.05***
Health IA- Germany					
Middle – Older Age	428	147	5.801	5.987	-.8
Young – Older Age	329	147	5.671	5.987	-1.25
Young – Middle Age	329	428	5.671	5.801	-.7
Income IA – Italy					
Middle – Older Age	1029	115	6.215	6.426	-.8
Young – Older Age	721	115	5.822	6.426	-2.2**
Young – Middle Age	721	1029	5.822	6.215	-2.95***
Health IA – Italy					
Middle – Older Age	993	112	5.593	6.107	-2**
Young – Older Age	694	112	5.376	6.107	-2.75***
Young – Middle Age	694	993	5.376	5.593	-1.7
Income IA – UK					
Middle – Older Age	892	259	6.457	6.208	1.35
Young – Older Age	822	259	5.947	6.208	-1.35
Young – Middle Age	350	464	6.234	6.796	-3.05
Health IA – UK					
Middle – Older Age	842	241	6.2	5.838	1.95
Young – Older Age	812	241	5.634	5.838	-1.05
Young – Middle Age	812	842	5.634	6.2	-4.5**

Note : the table reports the number of observations and mean value of inequality aversion in the income and health

domains in three countries by age groups under examination and undertakes a cross-country test of equality of means. Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1

Table A3. Between country age differences in inequality aversion

	Obs Country1	Obs Country2	Mean Country1	Mean Country2	dif	t value
Older						
<i>Income LA</i>	115	159	6.426	7.453	1.026***	-3.4
<i>Italy – Germany</i>					(.3)	
<i>Income LA</i>	259	159	6.208	7.453	1.244***	-4.95
<i>UK – Germany</i>					(.252)	
<i>Income LA</i>	259	115	6.208	6.426	-.217	-.75
<i>UK – Italy</i>					(.285)	
<i>Health LA</i>	112	147	6.107	5.987	.12	.4
<i>Italy – Germany</i>					(.319)	
<i>Health LA</i>	241	147	5.838	5.987	-.148	-.55
<i>UK – Germany</i>					(.271)	
<i>Health LA</i>	241	112	5.838	6.107	-.269	-.9
<i>UK – Italy</i>					(.292)	
Middle						
<i>Income LA</i>	1029	464	6.215	6.796	-.581	-3.9
<i>Italy – Germany</i>					(.149)	
<i>Income LA</i>	892	464	6.457	6.796	-.338**	-2.3
<i>UK – Germany</i>					(.148)	
<i>Income LA</i>	892	1029	6.457	6.215	.242	1.95**
<i>UK – Italy</i>					(.123)	
<i>Health LA</i>	993	428	5.593	5.801	-.208	-1.4
<i>Italy – Germany</i>					(.148)	
<i>Health LA</i>	842	428	6.2	5.801	4***	2.7
<i>UK – Germany</i>					(.148)	
<i>Health LA</i>	842	993	6.2	5.593	.608***	5.05
<i>UK – Italy</i>					(.12)	
Young						
<i>Income LA</i>	721	350	5.822	6.234	-.4123**	-2.
<i>Italy – Germany</i>					(.177)	
<i>Income LA</i>	822	350	5.947	6.234	-.286	-1.65
<i>UK – Germany</i>					(.174)	
<i>Income LA</i>	822	721	5.947	5.822	.125	.9
<i>UK – Italy</i>					(.14)	
<i>Health LA</i>	694	329	5.376	5.671	-.295*	-1.7
<i>Italy – Germany</i>					(.173)	
<i>Health LA</i>	812	329	5.634	5.671	-.037	-.2
<i>UK – Germany</i>					(.17)	
<i>Health LA</i>	812	694	5.634	5.376	.258*	1.9
<i>UK – Italy</i>					(.136)	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure A1. Income and health inequality Aversion by gender 2016

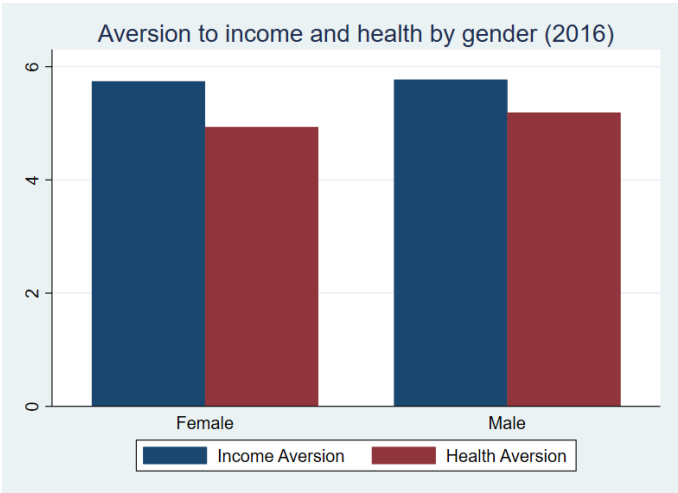


Figure A2. Income and health inequality Aversion by gender 2020

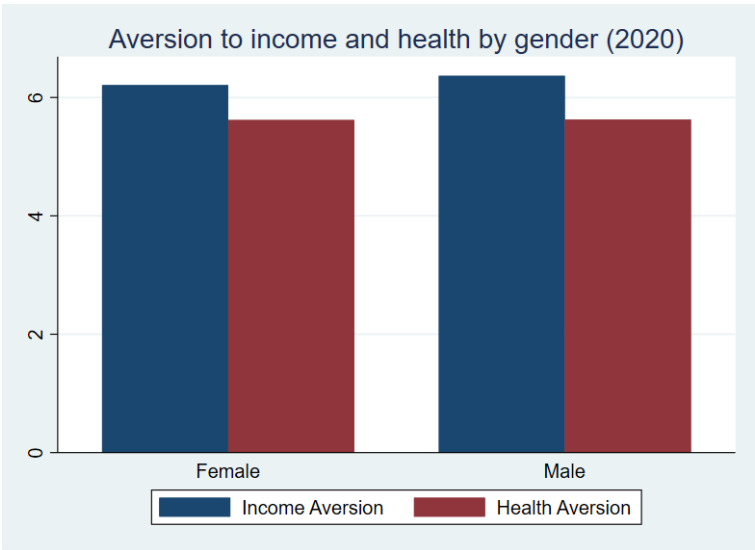


Table A4. Descriptive Statistics 2020

Variable	Obs	Mean	StdDev
Health Inequality Aversion	4598	5.742	2.581
Income Inequality Aversion	4811	6.258	2.695
Age group			
<25	764	20.466	2.526
25-64	4232	44.993	10.991
65+	690	68.961	2.965
Gender			
Male	2913		
Female	2756		
Education level			
Low education	629		
Medium education	3126		
High education	1934		
Income level			
Low income	1598		
Medium income	2461		
High income	927		
Risk attitude (scale of 1-10)			
Extremely risk loving	223	1	0
Moderate risk attitude	4736	5.707	1.856
Extremely risk averse	727	10	0
Country			
UK	2295		
Italy	2189		
Germany	1202		
Health shock			
No health shock	4627		
Minor health shock	502		
Major health shock	414		
Income shock			
No income shock	2807		
Minor income shock	1575		
Major income shock	1128		
Employment shock			
No employment shock	2538		
Temporary employment shock	2665		
Permanent employment shock	303		

Notes:

Education level: education levels up to lower secondary were classed as low education, education levels above lower secondary but below university level were classed as medium education, and education levels at university undergraduate level and above were classed as high education.

Income level: annual incomes below 25,000 euros in Germany and Italy and 20,000 GBP in the UK were classed as low income, incomes between 20,000 and 48,000 euros in Germany and Italy and between 20,000 and 45,000 GBP were classed as medium levels of income and incomes above these amounts were classed as high incomes.

Employment shock: responses: “I or a member of my household has had a temporary salary reduction, but still working”; “I or a member of my household has been put on furlough”; “I or a member of my household has been placed on temporary unpaid leave”; “I or a member of my household has temporarily closed my/their own business”; and “My or a member of my household’s financial situation has changed for another reason” were classed as temporary employment shocks whilst responses: “I or a member of my household has been made redundant”; and I or a member of my household has had to permanently close my/their own business were classed as permanent health shocks.

Appendix B

Table B1. Gender differences in Inequality aversion across countries – within country difference

Germany

	obs1	obs2	Mean1	Mean2	diff	t-value
Income Aversion						
Female – Male	462	511	6.652	6.745	.094 (.167)	-.55
Health Aversion						
Female – Male	419	485	5.848	5.73	.117 (.168)	.7

Italy

	obs1	obs2	Mean1	Mean2	diff	t-value
Income Aversion						
Female – Male	903	962	5.982	6.164	-.182 (.127)	-1.45
Health Aversion						
Female – Male	868	931	5.509	5.572	-.062 (.122)	-.5

Standard errors in parentheses

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

Note: This paper reports the within country gender differences in in inequality aversion estimates between genders.

Table B2. Gender differences in Inequality aversion across countries – between country difference

Female

	obs1	obs2	Mean1	Mean2	diff	t-value
Income Aversion						
Italy - Germany	903	462	5.982	6.652	.669*** (.154)	-4.35
Health Aversion						
Italy - Germany	868	419	5.509	5.848	-.338** (.15)	-2.25

Male

	obs1	obs2	Mean1	Mean2	diff	t-value
Income Aversion						
Italy - Germany	962	511	6.164	6.745	.582*** (.147)	-3.95
Health Aversion						
Italy - Germany	931	485	5.572	5.73	.159 (.146)	-1.1

Note: This paper reports the between country gender differences in in inequality aversion estimates between genders.

Standard errors in parentheses

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

Table B3. Inequality Aversion by Gender

	Male		Female	
2020	Mean	St.Dev	Mean	St.Dev
Aversion to Income	6.366	2.7	6.209	2.708
Aversion to Health	5.626	2.61	5.619	2.529
Income Shock (percentage)	.509	.5	.521	.5
Health Shock (percentage)	.17	.375	.165	.372
2016	Mean	St.Dev	Mean	St.Dev
Aversion to Income	5.771	2.481	5.74	2.353
Aversion to Health	5.188	2.383	4.933	2.403
Income Shock (percentage)	.153	.361	.178	.383
Health Shock (percentage)	.236	.425	.259	.439

Appendix C

Risk aversion question. Are you generally a person who is willing to take risks or do you try to avoid taking risks?

Please answer on the following scale, where 1 is very unwilling to take risks and 10 is very willing to take risks.

1 – Very unwilling to take risks

2

3

4

5

6

7

8

9

10 – Very willing to take risks

Don't know

Prefer not to say

Risk exposure question – Health: Have you or a member of your household suffered a medical emergency, in the last 3 months? Please select all that apply.

1. Yes, a minor medical emergency that did not require hospitalisation.
2. Yes, a major medical emergency that required hospitalisation
3. No medical emergency in the last 3 months
4. Prefer not to say.

Risk exposure question – Finance: Have you or a member of your household experienced any impact to finances in the last 3 months?

Please select all that apply.

1. Yes, minor impact to finances.
2. Yes, major impact to finances.
3. No, there has been no change to finances.
4. Prefer not to say.

Risk exposure - Employment: Still thinking about the last 3 months, which, if any, of the following describes your situation during this time?

Please select all that apply

1. I or a member of my household has had a temporary salary reduction, but still working
2. I or a member of my household has been put on furlough
3. I or a member of my household has been placed on temporary unpaid leave
4. I or a member of my household has been made redundant
5. I or a member of my household has temporarily closed my/their own business
6. I or a member of my household has had to permanently close my/their own business
7. My or a member of my household's financial situation has changed for another reason
8. None of these
9. I prefer not to say