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Instability of preferences due to Covid-19 Crisis and emotions: a natural experiment from urban Burkina Faso

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Abstract

The salience of the first Covid-19 crisis over a well-identified period represents an unexpected and abrupt change in the environment. This study uses the onset of the Covid-19 crisis to empirically examine whether risk and time preferences change in response to this exogenous shock. We use an original panel dataset conducted in January 2020 (before any event) and June 2020 (after the removal of strong economic measures) among women working in the informal sector in Ouagadougou, Burkina Faso. We use individual fixed effects on a balanced panel of 853 women to isolate the specific causal effect of the Covid-19 crisis on variation in attitudes toward risk and time over these six months and rule out alternative explanations for differences in preferences. We demonstrate strong preference instability: risk aversion changed over the period in both the gain (13%) and loss (-47%) domains, while impatience increased by 9%. We also show that risk aversion (in both domains) is non-sensitive to actual impacts, but appears to be driven by economic fears and concerns related to the Covid-19 crisis. We also find that greater exposure to the media reinforces preference instability: the more informed the respondent is, the more their risk and time preferences vary. The same phenomenon is observed when their source of information comes from the government or from a social network (Facebook and WhatsApp).

Keywords: Covid-19, Risk attitude, Impatience, Emotions, Media exposure.

JEL: D8, D9, C93, I18, O55

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1 Introduction

In the spring of 2020, the unanticipated shock of Covid-19 could be assimilated to a rare and sudden event, different from the usual economic downturns or more conventional climatic shocks. In several Sub-Saharan countries, restrictive economic measures were strictly implemented as soon as the first cases appeared, so that the number of cases stayed really low during the first wave. In these countries, the Covid-19 shock was more economic and emotional, although it represented an unprecedented and significant change in people's environment. Several articles have shown that the uncertainty and the considerable slowdown of the economy caused a decline in living standards and an increase in economic anxiety, especially at the beginning of the pandemic (Fetzer et al., 2021; Bargain and Aminjonov, 2021). In this paper, we show that the impact of the Covid-19 shock was severe as it also affected some deep parameters, notably risk and time preferences.

Contrary to the assumptions of standard microeconomic theory, empirical studies recently show that deep parameters can vary over time. A growing body of literature points out that these parameters are not immutable and can change due to economic, climatic, or conflict shocks (Chuang and Schechter, 2015; Cameron and Shah, 2015; Reynaud and Aubert, 2020; Callen, 2015; Voors et al., 2012; Hanaoka et al., 2018; Sakha, 2019). Several mechanisms come into play and can explain this instability. The most cited one relates to the adverse consequences of shocks, which modify people's points of reference and thus their risk attitudes (Kahneman and Tversky, 1979; Campbell and Cochrane, 1999). The Covid-19 crisis had a negative impact on the population's standard of living and generated greater risk aversion and impatience, particularly in the economic and financial fields. This change in risk behavior and time preference can translate to all domains, even those not affected by the shock in question. Gollier and Pratt (1996)'s "risk vulnerability" implies that in response to an increase in background risk (non-insurable and non-avoidable, as for the Covid-19 shock), individuals behave in a more risk-averse manner in other domains of avoidable risk. The second mechanism that may alter attitudes toward risk or time after Covid-19 is emotional (Lerner and Keltner, 2001; Loewenstein, 2000; Loewenstein and Lerner, 2003; Botzen et al., 2015; Eckel et al., 2009). Even if they have not experienced any loss, the fear (of contamination or job loss, for instance) and stress induced by economic and health uncertainty may alter risk and time preferences. Some studies have shown that the emotional channel may override more concrete explanations. For example, Guiso et al. (2018) show that changes in risk aversion after the 2008 global financial crisis are primarily triggered by fear and a change in perceived probability (whereas changes in expected wealth or income have no impact). When the emotional response induces a shift in risk perception or discount rate, the behavioral change may persist over time (Ho et al.,

2008; Lerner et al., 2015; Brown et al., 2018).

This empirical study makes use of an original survey to analyze whether risk and time preferences changed following the Covid-19 crisis in Ouagadougou, Burkina Faso. Providing some answers to this question is crucial because risk and time attitudes strongly influence a wide range of behaviors such as health and work outcomes, savings, risk-sharing strategies, and migration decisions (Barsky et al., 1997; Dohmen et al., 2011; Dawson and Henley, 2015; Hsieh et al., 2017; Van Der Pol et al., 2017; Kremer et al., 2019). Preference responsiveness after a shock or a change in the environment should even be higher in developing countries, where people lack appropriate institutions or compensatory mechanisms to buffer against the damaging impacts of shocks (Mosley and Verschoor, 2005; Kremer et al., 2019). Our study is based on a panel survey of 853 women working in the informal sector, conducted in January 2020 - before respondents were aware of the upcoming Covid crisis - and then in June 2020 - at the end of the economic restrictions. We identify the change in attitudes toward risk and time over a 6-month period. To elicit risk attitudes, we propose hypothetical gamble questions, similar to the Holt-Laury Paired Lottery Task (Holt and Laury, 2002). We capture time preferences using four sets of choice tasks, similar to Andersen et al. (2008) and Cassar et al. (2017). Our empirical strategy relies on a before-and-after comparison with individual fixed effects to isolate the variation in preferences in response to environmental changes between the two waves. Given the magnitude of the Covid-19 shock over the period, all characteristics that varied over the 6 months are directly or indirectly related to Covid-19, so we capture the causal effect of the Covid-19 crisis on preferences.

We observe a 13% increase in risk aversion when lotteries are presented in monetary gains. The effect is larger when lotteries are presented in terms of losses, with risk aversion decreasing by 47%. The reversal of the sign of the effect is consistent with the reflection effect of Kahneman and Tversky (1979), which postulates that preferences depend on the reference, inducing risk aversion for gains and risk-seeking for losses. We also find that impatience increased by 9% over the period. These results are robust to the different specifications. The second part of the paper analyzes the heterogeneous effects to reveal potential transmission channels. Specifically, we first rely on individuals' self-reports of the impact of the Covid-19 crisis on daily life and pandemic-related concerns. This suggestive evidence shows little effect on the actual consequences of Covid-19: preference instability is only amplified when the individual reports having difficulties with food or water access during the period, but is not affected by job loss nor by low-income levels. We find no additional effects related to the respondent's health status (such as poor general health or having had Covid-19 symptoms during the study period). In contrast, preference instability is exacerbated when the

respondent expresses concerns about the Covid-19 crisis (particularly regarding economic concerns or those related to more catastrophic scenarios such as economic collapse). Another way to capture the emotional mechanism is to examine the role of the media. Indeed, media can reinforce the emotional response by increasing risk perception and anxiety (Shachat et al., 2021; Sadish et al., 2021; Fetzer et al., 2021). We do find that the more informed individuals are, the higher the variation in their preferences over the period. Unfortunately, we cannot know the type of information assimilated, nor its veracity. However, the type of media used to keep up to date about the pandemic gives us some indications. For instance, social networks (Facebook, Whatapps) are more likely to generate fear and anger than traditional media (Depoux et al., 2020). We find that social networks as a primary source of information exacerbate preferences instability. In contrast, traditional media - television, radio, newspapers (which provide commentary and analysis on the situation and government announcements) and discussions with family and friends have no additional impact on preference variation. Together, this set of findings suggests that the emotional channel is dominant in Covid-19-related variation in risk and time preference.

We contribute to the literature in several ways. First, we complement the burgeoning research stream that studies the stability of risk and time preferences after a shock. Our specific setting (a sudden and unanticipated shock, pre- and post-shock panel data) allows for a clean identification, which avoids the main empirical flaws of this literature. The latter is far from having reached a consensus[1] in part because identifying the causal effect of shocks on preferences in a natural setting is difficult. Indeed, standard shocks (macroeconomic, natural disasters, and some conflicts) can, to some extent, be anticipated or avoided (by migration to less risky locations or by insurance), which leads to selection bias-related issues. In particular, most studies suffer from selective exposure (when individuals locate according to their preferences) and selective migration (when individuals migrate out of affected areas according to their preferences). Ruling out alternative explanations

[1]Much of this literature studies the impact of natural disasters and conflict, and the evidence is ambiguous. Some studies demonstrate higher levels of risk aversion after exposure to shock (Cassar et al., 2017; Cameron and Shah, 2015; Reynaud and Aubert, 2020). Conversely, others show a decrease in risk aversion (Eckel et al., 2009; Kahsay and Osberghaus, 2016; Voors et al., 2012), and some find different results depending on the domain (loss or gain) studied (Reynaud and Aubert, 2020). Regarding time preferences, results are also divergent, as some find that natural shocks increase impatience (Bchir et al., 2013; Cassar et al., 2017) while others show that they decrease impatience (Callen, 2015; Voors et al., 2012). Sample sizes, time horizons, and methodology differ widely across studies and may explain these divergent results. Regarding idiosyncratic shocks such as changes in income, unemployment, health status, or family composition, they do not appear to have an impact on preference changes over time (Chuang and Schechter, 2015; Sakha, 2019). On the contrary, macroeconomic shocks tend to have long-term effects on an individual's risk attitudes (Sakha, 2019). A more comprehensive review of the literature (including life-cycle effects) is available in Chuang and Schechter (2015).

for an observed difference in preferences requires a context in which an unexpected and abrupt change has occurred. In addition, only two studies use panel data (Sakha, 2019; Hanaoka et al., 2018). However, these studies only observe preferences after the shock occurrence, introducing noise into the causal identification. Moreover, selective attrition (if correlated with temporal stability of risk preferences) also makes it challenging to construct a valid counterfactual. In this study, we observe the same individuals just before the Covid-19 pandemic and six months after, once the various measures put in place at the beginning of the pandemic have been alleviated. Moreover, our sample does not suffer from migration bias (no one migrated between the two waves) or selective attrition (we reached 95% of our respondents and verified that there are no significant differences between attritors and non-attritors).

Second, we also contribute to the more specific literature on Covid-19 related preference change (Angrisani et al., 2020; Drichoutis and Nayga, 2021; Gassmann et al., 2020; Bu et al., 2020; Li et al., 2020; Ikeda et al., 2020; Shachat et al., 2021).[2] Most of the articles mentioned use a small sample size and a very specific population (mainly students or informed internet users) that may not consistently reflect behaviors in the field due to its singular characteristics. Furthermore, to our knowledge, no study has examined the impact of Covid-19 on preference stability in Africa. Though, African countries were hit by Covid-19 with an unequal intensity, thus in some countries few cases were recorded in 2020. For example, in Burkina Faso, the number of confirmed cases was 1000 and the number of deaths was 54 in July 2020.[3] Thus, previous analyses conducted in China or Europe mix the economic crisis with the health crisis. In this respect, the African context

[2] Angrisani et al. (2020) analyzes the risk preferences of professional traders (48 subjects) and undergraduate students (60 subjects) in London, England, and finds no change in risk aversion levels before and during the Covid-19 outbreak. Drichoutis and Nayga (2021) also find no significant difference in the preferences of 300 students in Athens, Greece, between before and after the pandemic. In contrast, Gassmann et al. (2020) analyze the impact of the lockdown on time, risk, and ambiguity aversion during the first pandemic wave in France and compare it to what was observed in 2016 (unbalanced panel of 314 subjects aged 18 to 25). They observe a decrease in patience and risk aversion during the lockdown, although the effects tend to disappear after a few months. In contrast, some studies find an increase in risk aversion. For example, Bu et al. (2020) exploit a survey of risk-taking behavior among 225 students in the city of Wuhan. They find that people in the hardest-hit provinces of China are even more risk-averse. Shachat et al. (2021) also find a short-term "disruption" in economic preferences from late January to early March 2020 among 396 students in Wuhan. Using online experiments, they provide evidence that people became more risk-averse and impatient than before the Covid-19 pandemic in China. Ikeda et al. (2020) administered an Internet survey in Japan (737 subjects over three waves) and find that people become more risk-tolerant.

[3] These numbers are most likely underestimated because only suspected cases and travelers were tested. Burkinabes were reluctant to be tested because of the psychosis caused by the disease and the fear of the disease (Kobiane, 2020).

deserves a specific investigation.

Third, this article also contributes to the literature showing the importance of media and information in shaping a wide range of behaviors and beliefs (Dupas, 2011; La Ferrara et al., 2012; La Ferrara, 2016; Banerjee et al., 2019) and responses to Covid-19 perceptions and behaviors (Simonov et al., 2020; Gutierrez et al., 2022; Bursztyn et al., 2020; Banerjee et al., 2020; Fetzer et al., 2021). We speculate that the media may have reinforced emotional responses to shocks by giving greater prominence to Covid-19 issues and, as a result, altering risk perceptions. This mechanism echoes Shachat et al. (2021), which observe a significant increase in risk aversion relative to gains among the study population immediately after two newsworthy events (the announcement of the Wuhan city lockdown and the death of media figure Dr. Li Wenliang). Our results suggest that the source of the media used matters: we indeed find an exacerbation only when the individual uses social networks.

The remainder of this paper proceeds as follows. In Section 2, we provide a brief overview of the expected impact of Covid-19 on preferences. Section 3 describes our data and presents the methodology used to estimate the expected change in attitudes after the onset of the Covid-19 pandemic. Section 4 provides the results and gives some robustness checks. Section 5 concludes.

2 Expected impacts of the Covid-19 crisis on preferences

Unstable preferences. There is no consensus on the empirical concept of stability, so we will first explain what we mean by instability. The strict definition of the preference stability assumption of Stigler and Becker (1977) empirically implies that an individual's observed preferences must be the same when measured at different points in time. Thus, according to the canonical approach, if we observe a change in preferences, it reflects only measurement errors and should be considered as meaningless noise (Schildberg-Hörisch, 2018). However, given the growing empirical evidence that preferences change significantly over time (due to age or shocks), it seems unlikely that notable changes in preferences are due solely to measurement errors. To harmonize the different concepts of preference instability, Schildberg-Hörisch (2018) proposes a conceptual framework where risk preferences are no longer considered as a single parameter but as a distribution, characterized by its mean and variance.[4] According to this framework, there are three possible reasons for the

[4]The conceptual framework of Schildberg-Hörisch (2018) draws on research in psychology on the stability of individual-specific personality traits (which might be related to what economists refer to as individual-specific parameters determining the curvature of the utility function). Personality traits are considered stable, but should

instability of individual preferences over time. First, it could result from a continuous change in the average level of risk preferences over the life cycle (the aging effect). An observed change in preferences over time may indeed simply reflect the aging of an individual, who becomes less risk-averse and more patient over the life cycle (Yesuf and Bluffstone, 2009; Tymula et al., 2013; Dohmen et al., 2017). Second, some exogenous shocks could induce an abrupt (and potentially permanent) change in the average level of risk preferences. Finally, temporary variations could be observed due to stress or emotions, causing high variance around the average level of preferences.[5] Our analysis excludes the aging explanation because the short period between our two surveys does not capture any life-cycle effect. However, preferences may vary within the time frame of our study because the consequences of Covid-19 are similar to those of a negative shock or because the period of the first half of 2020 was characterized by a high level of uncertainty, generating stress and anxiety (Fetzer et al., 2021).

Wealth change and background risk. A change in wealth is the mechanism most often cited in the literature to explain the instability of preferences following shocks. According to the habit persistence model, risk aversion varies with wealth level (Campbell and Cochrane, 1999). In this model, increasing wealth leads to a decrease in risk aversion. Cumulative prospect theory also adds that preferences depend on a reference point, not on absolute levels of wealth. This reference point may vary over time and across domains (gains or losses). By causing an unprecedented change in people's environment, the Covid-19 shock may have changed this reference point, modifying preferences accordingly. Because of its unprecedented nature, the Covid-19 crisis can also be viewed as a new background risk, or in other words, a new source of exogenous and uninsurable (economic and health) risks. With the deterioration of the individuals' wealth, Covid-19 should induce greater risk aversion in the economic and financial sphere. However, the change in attitudes may translate to all domains, even those not affected by the Covid-19 shock (Eeckhoudt et al., 1996; Guiso and Paiella, 2008; Gollier and Pratt, 1996). Eeckhoudt et al. (1996) models the fact that individuals become more risk-averse when the background risk becomes riskier, even in other independent risks. This property is described as "risk vulnerability" by Gollier and Pratt (1996). It implies that, in response to this additional background risk and even though the risks are independent, individuals behave in a more risk-averse manner for avoidable risks (Gollier and Pratt, 1996; Eeckhoudt et al., 1996). Individuals reduce their exposure to avoidable risks in order to control their overall risk

be conceptualized as density distributions that can vary for the same individual in response to a change in their environment. This intra-individual variability is referred to as conditional stability in Fleeson (2001).

[5]Measurement errors are excluded from the framework of Schildberg-Hörisch (2018) because the observed change in individual preferences in empirical studies is systematic and substantial.

exposure (Kimball, 1993). Macroeconomic and financial evidence confirms these theoretical predictions: the presence of (uninsurable) labor income risks alters saving and consumption behaviors, as well as the demand for insurance (Guiso and Paiella, 2008). Therefore, individuals facing new and multidimensional risks should be more risk-averse for other (insurable) risks.[6]

Emotional response. The Covid-19 crisis can also affect individuals' willingness to take risks and impatience by altering their emotions, even if they have not experienced any loss (Guiso et al., 2018; Barberis et al., 2001). For example, Li et al. (2020) and Lerner and Keltner (2001) mention that the fear of contamination influenced risk attitudes toward less risky decisions. Variations in impatience may also be explained by higher emotional stress that tends to reduce self-control (Tice et al., 2001). These studies echo previous literature emphasizing that fear, helplessness, and loss of control, the primary emotional responses to adverse shocks, can alter risk and time preferences (Lerner and Keltner, 2001; Loewenstein, 2000; Loewenstein and Lerner, 2003; Botzen et al., 2015; Eckel et al., 2009). The emotional pathway might, in some cases, perform better than other explanations: Guiso et al. (2018) show that changes in risk aversion after the 2008 global financial crisis are primarily triggered by fear and a change in perceived probability (while changes in wealth or expected income have no impact). Stress or fear are temporary and, therefore, may induce only short-term changes in preferences. However, the emotional response to a shock may have a longer-term effect when it induces a change in risk perceptions.[7] Indeed, shocks could change the perceived utility of bad outcomes and increase the curvature of the utility function (Loewenstein and Lerner, 2003; Guiso et al., 2018; Cassar et al., 2017). It can also affect the expected distribution of returns by altering the salience of some realizations: the salience theory of Bordalo et al. (2012) argues that individuals' attention is in fact directed toward particular realizations that, as a result, receive disproportionate weight. There is no doubt that in 2020, greater importance has been given on the Covid-19 context: most media around the world have crystallized their editorial lines on the news of the pandemic, with some even talking about "infodemic"(Zarocostas, 2020). The higher salience in Covid-19 issues probably intensified the perception of health and economic risks and, in

[6] Kahneman and Tversky (1979) indicate a decreasing sensitivity effect: when the level of risk is already high, adding small independent risks does not change people's behavior. However, it is impossible to estimate the level of risk in the pre-Covid-19 Burkinabe environment, or even to estimate the importance of the additional risks induced by Covid-19 relatively to other risks.

[7] Some studies show that risk perceptions tend to be strongly altered after exposure to an adverse event. For example, fear causes people to express more pessimistic risk perceptions and leads them to make more risk averse choices. Brown et al. (2018) also find a change in risk perceptions, as well as in the individual's beliefs about the frequency and magnitude of future shocks

this way, may have influenced risk and time preferences.

3 Data and Descriptive Statistics

3.1 Panel Survey of Women in Ouagadougou

Baseline survey. We rely on an original panel survey that is part of a larger project aiming to understand the health and economic behaviors of women working in the informal sector in Ouagadougou, the capital of Burkina Faso.[8] We conducted a baseline survey in January and February 2020 (face-to-face interviews). At that time, no respondent could have anticipated the coronavirus crisis in Burkina Faso or its economic consequences. Our sample comprised 1,700 female loan recipients randomly selected from two microfinance agencies. In this baseline survey, we collected information on the socioeconomic characteristics of respondents and their household members and their health and work behaviors. We also asked questions about hypothetical lottery choices to elicit individual risk and time preferences (see the following subsections). Note that our measure of wealth refers only to living conditions (location of water supply, type of toilet, electricity, type of fuel used for cooking and lighting) and asset ownership (radio, television, cell phone, refrigerator, car, motorcycle, farmland). Indeed, income and earnings are inappropriate for informal workers because they are very volatile. In addition, it is difficult to compare women's income levels because some pool their income with their husbands, but others do not. In addition, in the pilot survey, we found that these questions about individual or household income and earnings were embarrassing because they made respondents uncomfortable.

Follow-up survey. In June and July 2020, we conducted a follow-up telephone survey. Due to financial and logistical constraints, only half (randomly selected) of the baseline sample was re-interviewed. There were no significant differences between the two sub-samples (e.g., baseline survey respondents only and twice surveyed-see Table A1 in Appendix).[9] In this follow-up survey,

[8] This project is being conducted in partnership with a local microfinance institution with several agencies in Ouagadougou. The main objective of this large project is to assess the impact of a novel health-insurance program, introduced in late 2020, on a range of behaviors, including health, work, women's empowerment, and risk and time preferences. This paper bases the empirical analysis on the first two waves of surveys conducted several months before implementing the health-insurance program. Therefore, our results are not likely to be affected by it.

[9] Before randomly selecting participants for follow-up, we excluded women without cell phones (1% of baseline survey respondents) from our sampling frame. Our follow-up rate was exceptionally high, reaching 95% of randomly selected participants. The telephone survey protocol required interviewers to make three contact attempts in two days, with at least one day between attempts. We did not provide financial incentives to follow-up respondents

we re-asked questions about respondents' health and employment status and their risk and time preferences to observe these characteristics at two different time points. Socioeconomic characteristics (such as education or standard of living as measured by assets owned) were only collected in the first wave. Indeed, we assumed that these characteristics were unlikely to have changed over the six months. In the empirical exercise, these variables are therefore considered invariant during the study period, or in other words, not affected by the Covid-19 crisis. However, we supplemented the follow-up questionnaire with a series of questions on perceptions of the coronavirus, ways to obtain information, and specific economic impacts of the Covid-19 crisis.

Our final sample consists of a balanced panel of 853 women over 18 years of age and working in the informal sector, interviewed in January-February 2020 and June-July 2020.

3.2 The COVID-19 crisis in Burkina Faso

Government response to COVID-19. As in most African countries, Burkina Faso has recorded few cases of Covid (at the end of our follow-up survey in July 2020, the number of confirmed cases in Burkina Faso was 1,000, and the number of deaths was 54). Despite these low numbers, by mid-March 2020, the government had enacted strict measures restricting the movement of people, goods, and services. For instance, among the many restrictive measures put in place were a two-and-a-half-month curfew, a ban on public gatherings and events, the quarantine of major cities, the closure of schools, bars, and restaurants, and the disruption of public transportation for several months; and even public markets, and religious places for several weeks. Each week, the government made a public communication to inform the population about the evolution of the pandemic and the new measures put in place. In addition, prevention messages were widely disseminated through public and social media, such as wearing masks, washing hands with soap, using alcohol-based hand sanitizers, and social distancing.[10] Restrictions had been withdrawn by the time of our follow-up investigation, although protective measures such as social distancing are still strongly recommended.

Economic impacts. The low number of infections raises the question of the real impact of the Covid-19 epidemic on the daily lives of Burkinabes, particularly a few weeks after the measures were relaxed. First, the population of Ouagadougou did comply with the measures put in place

[10]Because no official website has centralized all actions taken or recommended, we rely on a review of major online newspapers, the government website, and social networks (Facebook). For a timeline of government responses to the real-time assessment of the epidemic situation, see https://askabout.io/covid-19/ask/what-is-the-government-response-timeline-for-burkina-faso/.

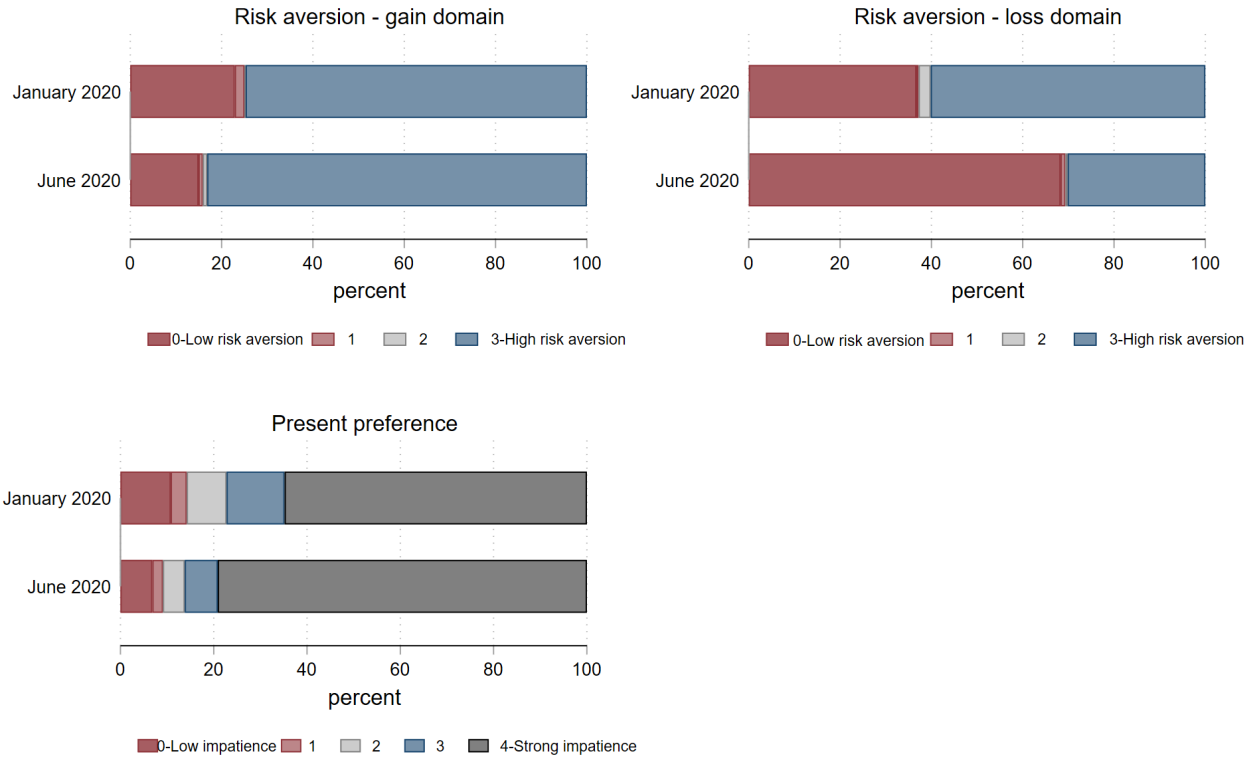
(Mathonnat et al., 2021). The figure B1 in Appendix B illustrates population movements in the Ouagadougou region based on Google community mobility trends. It shows a substantial increase in the location of private residences and a sharp decrease in mobility to recreation, grocery stores, and workplaces over our study period (in blue). In addition, our data suggest that respondents were aware of the measures in place. First, 98% cited public places as the most significant risk of contamination. The majority of people agreed (40%) or strongly agreed (54%) with the economic measures taken by the government. In addition, 88% of those surveyed in June and July 2020 still wore masks, while only 54% respected the social distance. The likely trade-off between the need for sustainable income generation and compliance with government measures may explain why recommended sanitary practices were not fully respected. These results are consistent with those found in Mathonnat et al. (2021), where respondents report compliance with sanitary and social distancing habits in general but admit to not following them all. Despite the imperfect compliance and the period of return to normalcy during the second wave, the restrictive measures adopted had negative consequences that persisted in July 2020. First, we see an increase in concerns about health and economic issues. For example, 35% of respondents anticipated a worsening economic situation in the medium term (Table B5 in Appendix). Second, the economic situation deteriorated between the two survey waves: only 83% of respondents were working the week before the second interview, whereas this was the case for 92% of them in the first wave. In addition, 54% of respondents reported frequent restrictions in their economic activities, and 7% said that these restrictions were systematic (Table B4 in Appendix). These statistics echo those found in studies describing that vulnerable (informal) workers in Africa have been disproportionately affected by the Covid-19 crisis (Price, 2020; Mahmud and Riley, 2020).

3.3 Measuring risk and time attitudes

Risk attitudes. To obtain information about attitudes toward risk, we used hypothetical gambling questions similar to Holt-Laury Paired Lottery Task (Holt and Laury, 2002). Each respondent was presented with three scenarios involving paired lotteries in an abstract environment with payoffs ranging from 0 to 20,000 FCFA. For each scenario, the respondent was asked to choose between an option where the payoff is certain (option A) and an option with two possible payoffs with equal probabilities (option B). The first pair of choices gives a higher expected payoff for the riskier choice (option B). On the contrary, the last pair of choices gives the same expected payoff for the option B as the option A (the safer choice, see Figure C1). We replicate the same experiment in the loss domain (Figure C2). Tables C1 and C2 illustrate how we measure risk aversion in the gain and loss domains. The number of risky decisions made by the respondent measures the individual's

degree of risk aversion in each domain on a scale of 1 to 4. Specifically, we measure risk attitudes by categorical variables ranging from 0 (neutral risk) to 3 (most risk-averse). In the main empirical analyses, we use a binary variable indicating that the respondent is "risk averse", i.e., always chose the safer option. The figure 1 below shows how risk and time attitudes changed between the two surveys. In the gain domain, individuals tend to be risk averse: in January 2020, 75% of respondents were in the most risk averse category. The Covid-19 crisis has increased risk aversion, with this proportion rising to 83% in June 2020. Consistent with the reflection effect of Kahneman and Tversky (1979), only 60% of people showed high risk aversion in January in the loss domain. This proportion dropped to 30% in June 2020.

Figure 1: Changes in risk and time preferences between January and June 2020



Time preferences. Following Andersen et al. (2008) and Cassar et al. (2017), time preferences are obtained using four sets of choices. Each set consists of a choice between hypothetically receiving 5,000 FCFA on the day of the survey or hypothetically receiving 20,000 FCFA in a longer time

frame. We set up four different time horizons that vary according to the choice set: the day of the survey versus one month, three months, six months, and twelve months (Figure C3). To measure subjects' impatience, we create a categorical variable ranging from 0 (weak preference for the present) to 4 (very strong preference for the present). We also use in the empirical analysis a binary variable indicating that the respondent is "impatient", capturing by grouping the last two categories. We observe in Figure 1 an increase in preference for the present after the Covid-19 crisis: individuals were more impatient in June 2020 (86%) compared to January 2020 (77%). The following section extends the analysis to examine whether these changes hold once we control for observable and unobservable characteristics.

4 Changes in risk and time preferences

4.1 Empirical specification

To test whether attitudes toward risk and time have changed due to Covid-19, we denote as Y_i the outcome of interest, representing the different measures of preferences (risk aversion in the gain domain, risk aversion in the loss domain, or impatience). Our treatment variable is a time dummy taking the value of 1 for the post-Covid-19 period (June 2020) and 0 for the pre-Covid period (January 2020).[11] Pooling the two waves, we estimate our model as follows:

$$Y_i = \alpha_i + \beta \cdot PostCovid_i + \theta_i + \delta W_i + \mu Y_i' + \varepsilon_i \tag{1}$$

In order to present a clearer relationship between preferences and the Covid-19 crisis and to control for any spurious associations that might bias our estimates, we include in some specifications individual fixed effects θ_i that eliminate any time-invariant characteristics. We also control for W_i, i.e., having worked in the week prior to the survey. Moreover, as recommended in this literature, we include the time (or risk) preferences Y_i' to account for relationships between these variables (Dohmen et al., 2010; Bchir et al., 2013; Cassar et al., 2017).

β captures the causal effect of the Covid-19 crisis on preferences. This is the global and multi-dimensional effect of Covid-19, encompassing changes in income, occupational status, stress, and

[11] The use of a dummy variable as a treatment implicitly implies that the Covid-19 crisis affected every woman in our sample homogeneously. In our case study, this is not a strong assumption: as mentioned earlier, our sample is composed of women microentrepreneurs living in the same area (Ouagadougou) and exposed to the same implemented measures and health risks.

uncertainty in the first six months of 2020. Our estimates are unlikely to suffer from reverse causality or selection bias because of the exogenous and unexpected nature of this singular shock. Given the importance of this single event, we consider any change during this period in economic (income, employment) and emotional (stress, uncertainty, anxiety) outcomes to be related to Covid-19, either directly or indirectly. However, some omitted variables may remain and lead us to misinterpret any change in preferences over the analysis period as being caused solely by Covid-19. Some factors, time-invariant, are captured by the individual fixed effects. For example, the willingness to take long-term risks or the curvature of the individual utility function and its risk premium should be considered as personality traits, which vary little over the life cycle. Other determinants of preference instability, such as education or age, are unlikely to have changed over the 6-month period. These medium-term characteristics are also absorbed by fixed effects. An exception may be changes in wealth over the period that may have induced a change in attitudes, if they are reference-dependent. As explained earlier, our empirical measure of wealth focuses on asset ownership to avoid the reporting bias associated with income. Indeed, income emerged as a sensitive issue in the pilot survey and was difficult to compare across individuals, since some women do not pool their income with family members. Asset ownership is a very stable measure of living standards, and it is unlikely to have changed over the study period for reasons non-related to the Covid-19 crisis. However, a change in income between January and June 2020 unrelated to Covid-19 may have happened. We believe that if unrelated to Covid-19, i.e., not related to existing restrictions or declining overall economic activity, this short-term income change should not alter preferences. Indeed, seasonality in income is predictable and to our knowledge, no study has shown that attitudes toward risk and time change with seasonal fluctuations in income. In addition, no other shocks occurred in Ouagadougou between January and June 2020.

Another possible explanation for the observed variation in preferences over time is related to measurement issues. In the pilot survey, we calibrated the amount and time horizon to best fit the context. In addition, cognitive ability, education, and age, which are strongly correlated with noisy behavior in risk elicitation experiments (Andersson et al., 2020; Choi et al., 2014), are captured by individual fixed effects. Thus, we assume homogeneous noise (i.e., classical measurement errors) over time for each individual in our estimates. In other words, once fixed effects have excluded cognitive abilities, arbitrary or inconsistent responses can be considered random. Furthermore, in our framework, the respondent is faced with the same decisions at two moments close in time. This actually increases the risk of some path dependence, i.e., perfect correlation over time for each individual. As a result, the probability of finding variation in preferences is reduced. Thus, while we cannot rule out the existence of some measurement error in our estimates, it seems unlikely that

noise alone could cause such large differences in individual preferences.

4.2 Main results

Changing attitudes towards risk in the gain domain. Table 1 presents estimates of the impact of the Covid-19 crisis on risk attitudes in the gain domain, using linear probability models. The dependent variable is binary, representing high risk aversion. All specifications allow for robust standard errors.

Table 1: Effect of Covid-19 crisis on risk aversion - gain domain

	(1)	(2)	(3)	(4)
Post Covid-19	0.084***	0.086***	0.101***	0.090***
	(0.019)	(0.019)	(0.020)	(0.020)
Preference for present				0.131**
				(0.039)
Relative effect (%)	11.24	11.51	13.52	12.04
Nb. Observations	1676	1676	1572	1572
Robust standard errors	✓	✓	✓	✓
Individual fixed-effects		✓	✓	✓
Having a job			✓	✓

Authors' estimates for the period January 2020 to June 2020.

Post Covid-19 is a dummy variable indicating the second wave (June 2020).

Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

We begin with column (1), which estimates the impact of Covid-19 on risk aversion without any controls or fixed effects. Consistent with what we observe in Figure 1, the estimates confirm a significant shift in risk attitudes in the gain domain towards greater risk aversion after the Covid-19 crisis. On average, individuals are eight percentage points more likely to choose the certain option. For ease of interpretation, we calculate the relative effect of each estimate using the average level of risk aversion of January 2020 as a base reference. In terms of relative effects, our results show a 11% increase in risk aversion between January and June 2020 (column (1)). Using individual fixed-effects (column (2)) does not change the magnitude of the effect. This implies that the instability in risk aversion associated with Covid-19 in the gain domain is not caused by time-invariant characteristics, such as underlying fundamental risk preferences, cognitive abilities, education, age, or personality traits. The estimates are also remarkably stable when we control for being employed in the week before the survey (column (3)). This suggests that job instability

during this period does not explain the variation of preferences. The relative contribution of the individual level of impatience (a dummy taking the value of 1 if the individual has a strong preference for the present) is marginal, as the average effect is barely affected when it is included (column (4)).

Table D1 in Appendix D presents several robustness checks using alternative specifications. All alternative specifications produce similar estimates (both in terms of significance and magnitude). Precisely, column (1) corresponds to our main specification described in Table 1. In column (2), we replace the robust standard errors with bootstrapped standards errors, leaving the results unchanged from the first column. Column (3) presents the results of the estimation using random effects. Unlike fixed-effects estimates that absorbed time-invariant characteristics, in this specification, we control for age, education, employment status, standard of living, number of people living in the household, and subjective health status. The specification with random effects leads to a similar conclusion: the Covid-19 crisis increased individual risk aversion in the gain domain. We also test whether our results can be influenced by individuals suffering from chronic stress and anxiety by excluding individuals who reported suffering from it in the baseline survey (5% of the initial sample). The results barely change when we restrict the sample to non-anxious individuals (column (4)). We also replicate these robustness checks using the categorical measure of risk aversion on a 1 to 4 scale (column (5) to (8)). The effects are very similar to those of the binary measure since, on average, we find a 12% increase in the probability of choosing a safer category after the Covid-19 crisis.

Changing attitudes toward risk in the loss domain. One of the contributions of our study to the preference instability literature is to provide evidence on how shocks can influence risk preferences in the loss domain, in the same vein as Reynaud and Aubert (2020). The impact of Covid-19 may be different depending on the domain under study: an individual is more likely to be risk-averse in the domain of gain but risk-lover in the domain of loss (Kahneman and Tversky, 1979; Levin et al., 2012; Reynaud and Aubert, 2020).[12] Little literature provides clues to explain these differential behaviors. The psychological literature mentions a selective allocation of attention to loss or gain outcomes: people tend to pay more attention to outcomes framed as losses than presented as gains (Willemsen et al., 2011; Pachur et al., 2018). Table 2 shows the estimates when

[12]The reflection effect has been demonstrated in prospect theory (Kahneman and Tversky, 1979; 2013). People feel losses more intensely than gains. They thus prefer to choose riskier lotteries in the loss domain, offering a possibility of a minimal loss rather than a certain loss. The attitude towards risk is reversed in the gain domain, where the certain gain is preferred in most cases (Li et al., 2011). Some empirical studies show that the error term is smaller in the gain domain than in the loss domain (Lopes, 1987; Gonzalez et al., 2005; Baucells and Villasís, 2010), suggesting that choices in the loss domain create more conflict and cognitive effort and are therefore less stable.

the lotteries are expressed in terms of losses. We find different responses to the Covid-19 crisis in this domain: the magnitude of the effect is much more substantial in the loss domain than in the gain domain, and the attitude toward risk is reversed. Indeed, we find that respondents are more likely to choose risky options after the Covid-19 crisis. The results show that, on average, individuals are 28 percentage points less likely to choose the least risky option. In other words, we observe a 47% decrease in risk aversion in the loss domain between January and June 2020. Table D2 reproduces the same robustness checks explained in the previous subsection. We find that the results are stable in terms of magnitude regardless of the specification used (bootstrapped standard errors, random fixed effects with time-invariant controls) or the definition of the dependent variable (categorical instead of binary). Table 2 and Table D2 indicate that individuals are more likely to take risks in the loss domain following the Covid-19 crisis. This result is similar to those found in Laury and Holt (2008) and Shachat et al. (2021).

Table 2: Effect of Covid-19 crisis on risk aversion - loss domain

	(1)	(2)	(3)	(4)
Post Covid-19	-0.300***	-0.299***	-0.283***	-0.283***
	(0.023)	(0.023)	(0.025)	(0.025)
Preference for present				-0.004
				(0.048)
Relative effects (%)	-49.88	-49.72	-47.06	-47.06
Nb. Observations	1667	1667	1564	1564
Robust standard errors	✓	✓	✓	✓
Individual fixed-effects		✓	✓	✓
Having a job			✓	✓

Authors' estimates for the period January 2020 to June 2020.

Post Covid-19 is a dummy variable indicating the second wave (June 2020).

Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

While being a nice illustration of the reflection effect of Kahneman and Tversky (1979), the opposite direction of impact may concretely illustrate that different dimensions of Covid-19 crisis trigger each domain. In a recent study, Galandra et al. (2020) show a preferential allocation of attentional resources to the most relevant domain during the Covid-19 outbreak in Italy. Specifically, the authors use a modified version of the Holt-Laury Paired Lottery Task that is explicitly linked to adverse health and employment outcomes in the context of the Covid-19 pandemic. They observe risk-averse behavior with employment-related lotteries and risk-seeking behavior with health-related lotteries. They suggest that individuals may be more willing to make risky decisions for their health

to achieve the best possible outcome. However, people are concerned about the potential long-term economic consequences, for instance in their employment conditions, so they exhibit greater risk aversion in this dimension. We can easily extend the conclusion of this suggestive evidence to consider that time preferences also respond to different aspects of this multidimensional crisis.

Change in impatience Table 3 presents the results for the impact of Covid-19 on impatience. This table uses the same specifications as those used for risk aversion, except for the last column (4), which controls for risk aversion in the gain domain. We observe that respondents become eight percentage points more impatient after the Covid-19 crisis. We also provide relative effects to assess the magnitude of the impact: impatience increased by 10% after the Covid-19 crisis. Again, as in the case of risk aversion, the results do not vary when we run different specifications or use different definitions (see D3). In addition, we replicate the estimates with a different dummy variable that refers to a case where the respondent consistently chooses immediate gain (i.e., very high impatience captured by the last category of time preferences). This alternative result shows a more significant effect: The Covid-19 crisis increased impatience by 20% (results not shown, but available upon request). The observed increase in impatience due to Covid-19 is consistent with the results obtained by Bchir et al. (2013) and Cassar et al. (2017).

Table 3: Effect of Covid-19 crisis on impatience

	(1)	(2)	(3)	(4)
Post Covid-19	0.078***	0.078***	0.083***	0.074***
	(0.018)	(0.018)	(0.019)	(0.02)
Risk aversion (gain domain)				0.127**
				(0.042)
Relative effects (%)	10.22	10.22	10.87	9.69
Nb. Observations	1742	1742	1633	1604
Robust standard errors	✓	✓	✓	✓
Individual fixed-effects		✓	✓	✓
Having a job			✓	✓

Authors' estimates for the period January 2020 to June 2020.

Post Covid-19 is a dummy variable indicating the second wave (June 2020).

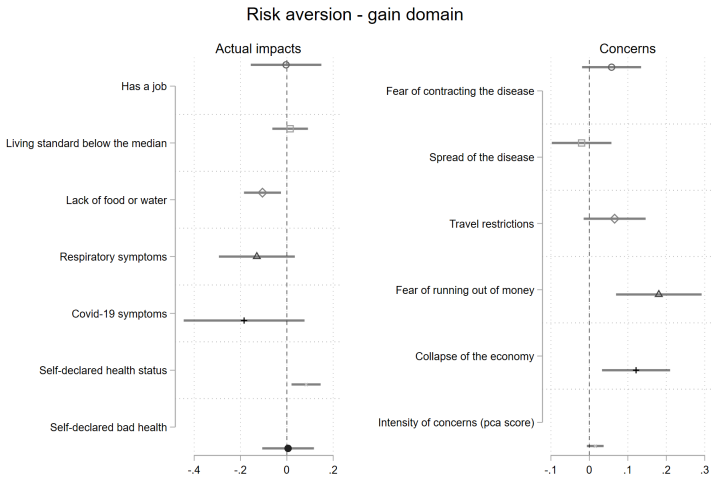
Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

Actual impact versus concerns regarding Covid-19 A limitation of our study is that we measure the overall impact of Covid-19 without differentiating which dimensions of this crisis generate a change in preferences. In this section, we attempt to shed light on potential underlying mechanisms behind our findings, by using interaction terms. The graphs below present the results of these interactions between the Post-Covid binary variable and various self-reported Covid-19 impacts. These measures suffer from reporting bias and should not be interpreted as causal mechanisms. Nevertheless, although imperfect, they allow us to differentiate Covid-19's impact on daily life (actual self-reported impact), which is closer to the economic and health pathways, from concerns induced by the Covid-19 crisis, which are more related to the emotional channel.

Two graphs are presented for each domain (gain domain in Figure 2, loss domain in Figure 3, time preferences in Figure 4). The first graph identifies the mechanisms that actually impacted respondents' daily lives: employment status (having a job dropped from 92% to 83% between the two survey waves), having an average standard of living below the sample median, having regularly ran out of food or water during the Covid-19 period (37% of households). We find few effects of these actual economic impacts: having a job significantly attenuates the decline in risk aversion in the loss domain only. In contrast, running out of food or water significantly increases risk aversion in the gain domain. We also examine health-related impacts, such as whether individuals experienced coughing and/or breathing difficulties during the period (4.9% of respondents), or whether they experienced Covid-19 symptoms (fever and coughing or breathing difficulties, and vomiting or diarrhea - 2% of respondents). We find no effect, potentially due to the low prevalence of these symptoms. Besides, as noted above, there were very few confirmed cases of Covid-19 at the time of the surveys. Finally, we interact with respondents' self-reported health status (on a scale of 1 to 4) and only with those who reported poor health (15% of respondents), to isolate those most at risk. We find no effect of these variables on the variability of preferences over the period.

The graphs on the right refer to the respondents' concerns generated by Covid-19. Only 2% of respondents reported having no concerns (see Appendix B). We distinguish several types of concerns: fears that the respondent or a family member will contract the disease (51% of respondents), fears of running out of money (for food, medicine or credit repayment, 33%), fear that the economy will collapse (40%), that it will no longer be possible to travel (42%) and that the disease will spread everywhere (49%). We can see that fears related to the disease have no effect. On the other hand, fears associated with the economic context have a significant effect on risk aversion: being afraid of running out of money increases risk aversion for gains (coefficient of 0.18, corresponding to an additional relative increase of 24%) and decreases risk aversion for losses (coefficient of -0.23, cor-

Figure 2: Actual impact and concerns regarding the Covid-19 crisis - Risk aversion - gain domain



responding to an additional relative decrease of 38%). There is also a strong and significant effect of fear of economic collapse (+16% additional increase in risk aversion in the gain domain, and -20% additional decrease in risk aversion in the loss domain). Fear of travel restriction increases risk-taking in the loss domain (-25% additional risk aversion) and increases impatience (+13% additional).

Although prone to many reporting biases and measurement errors, it is striking that the actual effects of the Covid-19 crisis had little impact on preferences. In contrast, economic concerns significantly increase preference variability over the period. This result suggests that the main channel of preference variation due to Covid-19 is emotional. In this sense, these results are similar to those of Fetzer et al. (2021) who found an increase in economic anxiety in the early weeks of Covid-19. Using experiments, Fetzer et al. (2021) showed that individuals' beliefs about the mortality and contagiousness of the coronavirus shaped this increase in anxiety. In our context, the health risk is less salient than the economic risk, and it is indeed economic concerns that, months after the onset of the crisis and weeks after the end of the restrictive measures, influence preference instability. This result is consistent with the psychosocial literature, which shows that fear is related to risk-taking. For example, Lerner and Keltner (2001) show that more fearful individuals are less likely to take risks in a hypothetical situation. In an experiment involving randomized electric shocks, Cohn et al. (2015) also show that the fear of the electric shock (and not the actual shock) decreases financial risk-taking.

Figure 3: Actual impact and concerns regarding the Covid-19 crisis - Risk aversion - loss domain

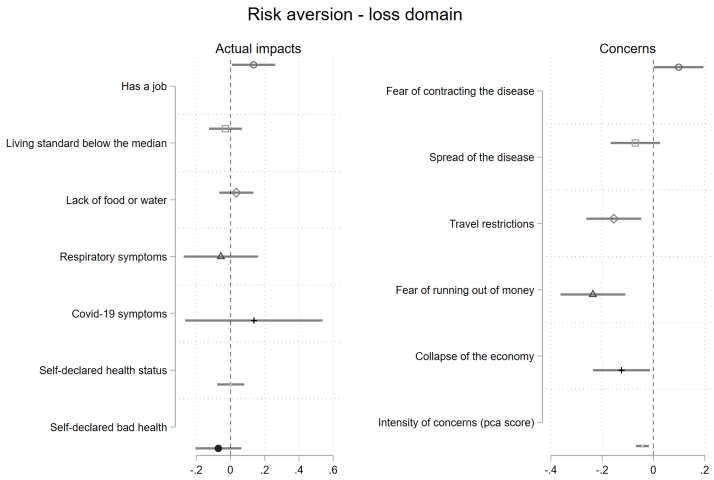
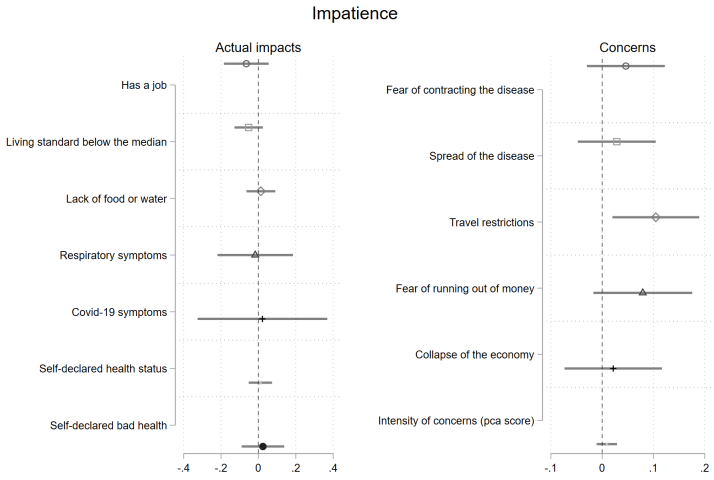


Figure 4: Actual impact and concerns regarding the Covid-19 crisis - Impatience



4.3 Media exposure

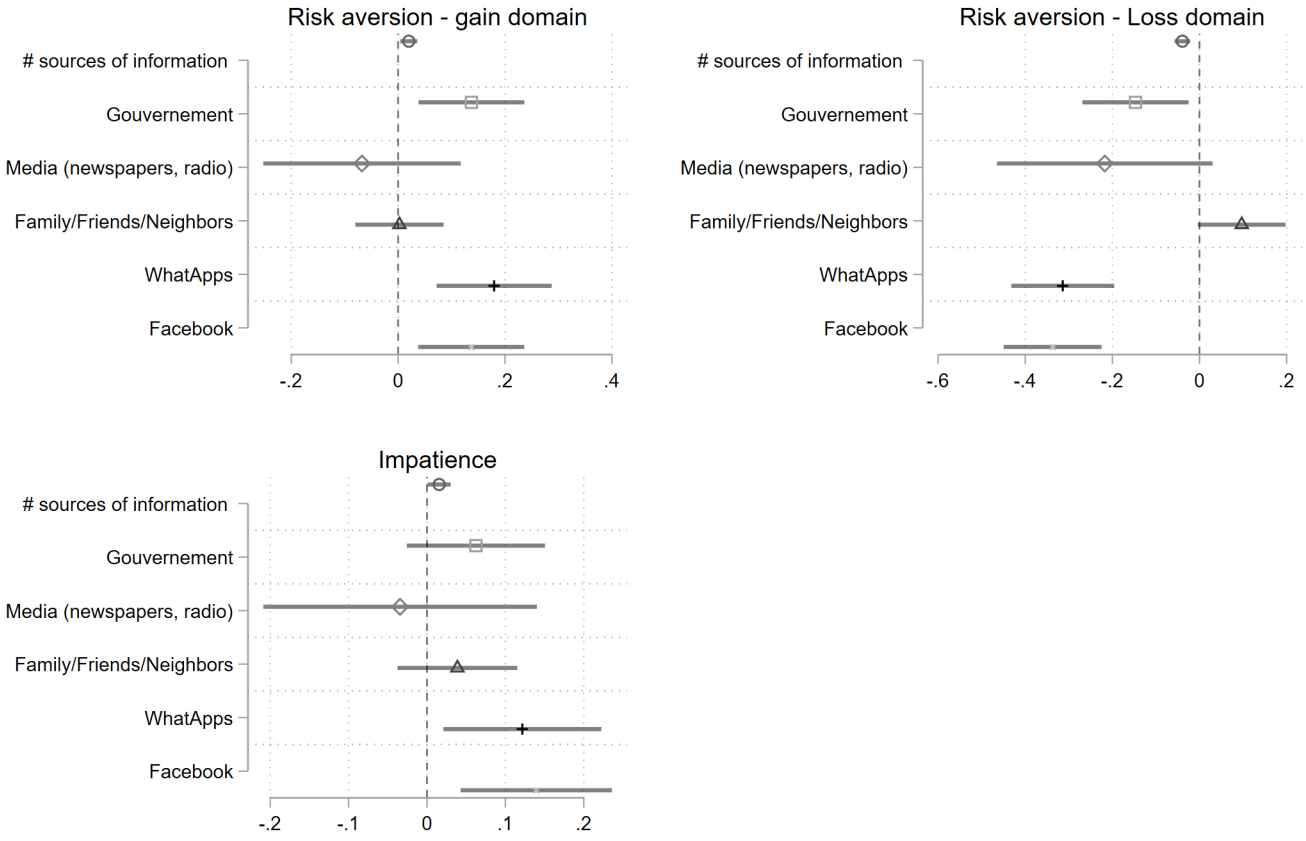
We take the analysis a step further by explicitly examining the role of media exposure. Fetzer et al. (2021) indeed show that news conveying the mortality and contagiousness of Covid-19 increases economic anxiety. In their study, Shachat et al. (2021), Sadish et al. (2021) also illustrate this mechanism as they observe a significant increase in risk aversion in the gain domain in the immediate aftermath of two publicized events (the announcement of the quarantine of the city of Wuhan and the death of Dr Li Wenliang, a media figure). We start from the intuition that informed people should react differently to the Covid-19 crisis than less informed people. Specifically, the media conveys information about the development of the coronavirus crisis and should reinforce emotional responses to the situation through increased risk perception, fear, and anxiety.

To shed some light on the role of media exposure, we ask participants to report the sources of information used to keep up to date regarding the Covid-19 evolution and the measures and restrictions implemented by the government (Figure B2 and Table B2). We first interact our Post-Covid dummy with the number of media used. We report in Figure 5 only the interaction term. We find that the more a person uses multiple sources of information, the more strengthened is the impact of Covid-19 on preferences. Using one more information source increases risk aversion in the gain domain by an additional two percentage points. At the same time, it decreases by a further four percentage points in the loss domain and increases impatience by an extra 1.6 percentage points. Besides, literature has highlighted the importance of information accuracy on individual beliefs and behaviors in the specific context of Covid-19.[13] Unfortunately, we are not able to capture the type of information received and how much attention they paid to it. Moreover, many unobservable behaviors can explain why people diversify their sources of information. Crepaz and Arikan (2021) expose different motivations explaining a high level of information, such as the seeking out for correct or accurate conclusion or the seek of confirmation to prior beliefs. In contrast, a low level of information may reflect some distrust in the information disclosed or some backfiring effect (when respondents more strongly endorse a misperception about a controversial issue if their beliefs or

[13] Gutierrez et al. (2022) randomized information about the epidemic in an online survey in Mexico. They show that inaccurate real-time information due to reporting death delays leads to individuals being slower to adopt protective behaviors and alter their perceptions regarding the severity of the epidemic. Simonov et al. (2020) also find that a one percentage point increase in Fox News viewership, a leading news media channel that denied expert recommendations from the global health communities and minimized the danger of Coronavirus, reduced the propensity to stay at home by 8.9 percentage points. Bursztyn et al. (2020) examine how exposure to different informational content - even in a short-term period- drives beliefs, behavior, and downstream health outcomes and find differences in the timing of adoption of cautious behavior according to which shows is viewed.

predispositions are challenged). We do, however, have data on the sources of information (Figure 5). Social media for instance, is considered to have a faster diffusion of information and increase fear and anger (Depoux et al., 2020). We first find that governmental and social media (Facebook and WhatApps) have strengthened effects on the instability of preferences due to the Covid-19. These results are in line with previous research on the impact of official information disclosure on behaviors (Banerjee et al., 2019) and on social media (Oh et al., 2021; Zeballos Rivas et al., 2021).

Figure 5: Heterogeneity according to the sources of media



Author's estimations for the period January 2020 to June 2020. Only the interaction terms is represented in this figure.

5 Conclusion and further research

In this study, we take advantage of the Covid-19 epidemic to empirically test whether risk and time preferences remain stable over time. The previous literature on the impact of shocks on preference stability focuses on macroeconomic shocks, natural disasters, or conflicts (Chuang and Schechter, 2015). The Covid-19 shock deserves an appropriate analysis because of its specific characteristics: it is a singular life-threatening shock, causing anxiety, with long-term consequences. Unlike regular economic downturns or frequent weather shocks, people may change their preferences more substantially as a result of an infrequent and striking event with unpredictable consequences. More importantly, the Covid-19 crisis was unexpected, uninsurable, and exogenous: it is a quasi-perfect natural experiment. We rely on a unique panel data set that allows us to track changes in the risk and time preferences of the same individual, observed just before the Covid-19 pandemic (January 2020) and six months after (June 2020) in Burkina Faso. We combine this before-and-after comparison with individual fixed effects to isolate the specific impact of Covid-19 on preference instability. Unlike previous research that suffers from methodological problems such as lack of panel data, selection bias in exposure, migration or attrition, we provide a clear identification.

This paper first demonstrates that individual preferences have changed following the Covid-19 crisis. Specifically, we show a 13% increase in risk aversion in the gain domain between January and June 2020 and a 47% decrease in risk aversion in the loss domain over the same period. Impatience increases by 9%. The results are robust to alternative specifications and outcome definitions. The second part of this paper consists in trying to identify the mechanisms underlying this instability. Using interactions, we show that preference variability is little influenced by actual consequences experienced by respondents during Covid-19, such as losing a job, not having enough food and water, or having a bad health in general, or Covid-19 symptoms. In contrast, preference instability is exacerbated when respondents express strong concerns about the economic aspects of the Covid-19 crisis, such as fear of running out of money or the economic collapse. Fears about health aspects, such as the spread of the disease or contracting it, have no effect. These results suggest that the emotional channel has much more influence on preference instability than the actual consequences of the Covid-19 crisis. A second piece of evidence for the prominent role of emotions is highlighted with media exposure, which can increase anxiety and fear, and thus strengthen the emotional response. We find that the more informed a person is, the more unstable their preferences become. Similarly, we report that these effects are enhanced when she uses social networks (WhatsApp and Facebook) to keep up with health and economic developments in Covid-19.

This study is limited by the fact that we observe the instability of preferences in the very short term. According to Schildberg-Hörisch (2018), preference variability can be temporary, especially if it is driven by emotion. A return to normal is therefore likely, unless it has modified the perception of risk in a global way, or the discount rate (Ho et al., 2008; Lerner et al., 2015; Brown et al., 2018). Moreover, even if temporary, this variation in preferences may have longer-term effects if it has led to different decisions and behaviors in real life. We plan to explore these issues in future research with the same participants. Indeed, this study is part of a larger project on health insurance adoption. Thus, we will soon be able to observe whether 18 months after the Covid-19 shock, preferences have returned to their initial level or whether the change in preferences is sustainable. Similarly, we will be able to observe whether those most concerned about the Covid-19 crisis have increased their take-up of the proposed health insurance. This question is fundamental from a political point of view: policy options will be different if preferences have evolved durably to a new level or if preferences are temporarily unstable following shocks or a change in the environment.

Authors statement

Declaration of competing interest

We, Delphine Boutin, Haris Megzari and Laurene Petitfour, the authors of the manuscript entitled "Instability of preferences due to Covid-19 Crisis and emotions: a natural experiment from urban Burkina Faso", gratefully acknowledge financial support from Gretha and Larefi (University of Bordeaux) and from Agence Française du Développement (AFD). We have no material or financial interest in this investigation or any other funding to disclose. The findings expressed in this paper are those of the authors and do not necessarily represent the views of the IMF or its partners.

Pre-registration

The trial was pre-registered with the American Economic Association's Trial Registry https://www.socialscienceregistry.org/trials/8548.

Ethics

This study was approved by the *Comité d'éthique institutionnel pour la recherche en Sciences de la santé- IRSS A027-2019*. All study participants provided informed consent.

Contributorship statement

Delphine Boutin and Laurène Petitfour designed the study, sought funding and conducted data collection. Delphine Boutin, Laurène Petitfour and Haris Megzari performed the data analysis. Delphine Boutin wrote the manuscript.Delphine Boutin, Laurène Petitfour and Haris Megzari agreed with the submitted manuscript.

Data availability

Anonymized data will be made available upon request.

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Appendix A: Statistics

Table A1: Sample selection: Comparison of panel and non-panel respondents

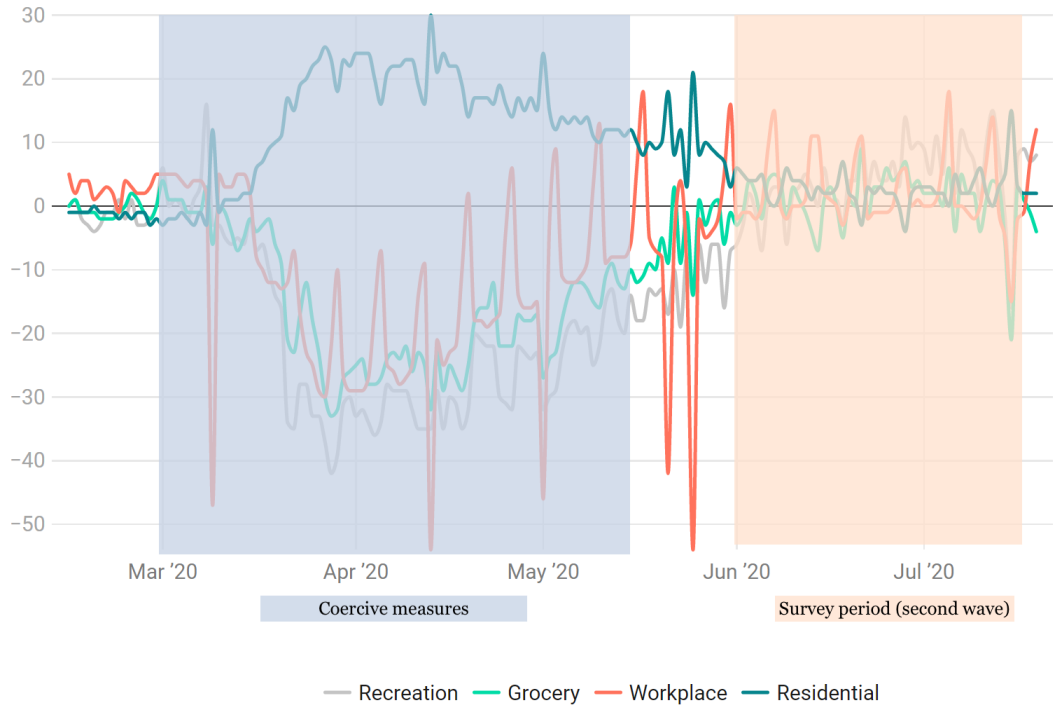
	January only			January and June			T-test
	#	Mean	Sd dev	#	Mean	Sd dev	P-value
Education							
Can read and write	961	0.32	0.47	854	0.34	0.47	0.349
Primary	352	0.67	0.47	351	0.68	0.47	0.706
Secondary	352	0.30	0.46	351	0.29	0.45	0.822
Higher	352	0.03	0.18	351	0.03	0.17	0.670
Work							
Has worked last week	947	0.91	0.28	847	0.92	0.27	0.409
Self-employed	961	0.96	0.20	854	0.96	0.19	0.732
Living condition							
Electricity	961	0.00	0.05	854	0.00	0.00	0.157
Latrines	961	0.88	0.33	854	0.88	0.32	0.558
Oil for cooking	961	0.63	0.48	854	0.66	0.48	0.162
Mobile phone	961	0.99	0.12	854	1.00	0.05	0.00
Television	961	0.50	0.50	854	0.55	0.50	0.053
Fridge	961	0.08	0.27	854	0.07	0.25	0.426
Car	961	0.06	0.23	854	0.08	0.27	0.074
Moto	961	0.88	0.33	854	0.85	0.36	0.114
Bike	961	0.94	0.24	854	0.94	0.23	0.563
Cultivable land	961	0.09	0.28	854	0.07	0.26	0.125
Health self-assessment							
Very good	960	0.21	0.40	854	0.18	0.39	0.204
Good	960	0.64	0.48	854	0.66	0.47	0.280
Bad	960	0.15	0.36	854	0.15	0.35	0.883
Very bad	960	0.01	0.07	854	0.01	0.08	0.622

Appendix B: Coronavirus Crisis in Ouagadougou (Burkina Faso)

Suggestive evidence of compliance

The figure below shows the compliance of Burkinabe located in the Ouagadougou region with the measures put in place to contain COVID-19. Data comes from the Google Community Mobility dataset.[14]

Figure B1: Flow of people's movement since the first Covid-19 case in Burkina Faso



Authors from Google Community Mobility data in Ouagadougou region (Burkina Faso)

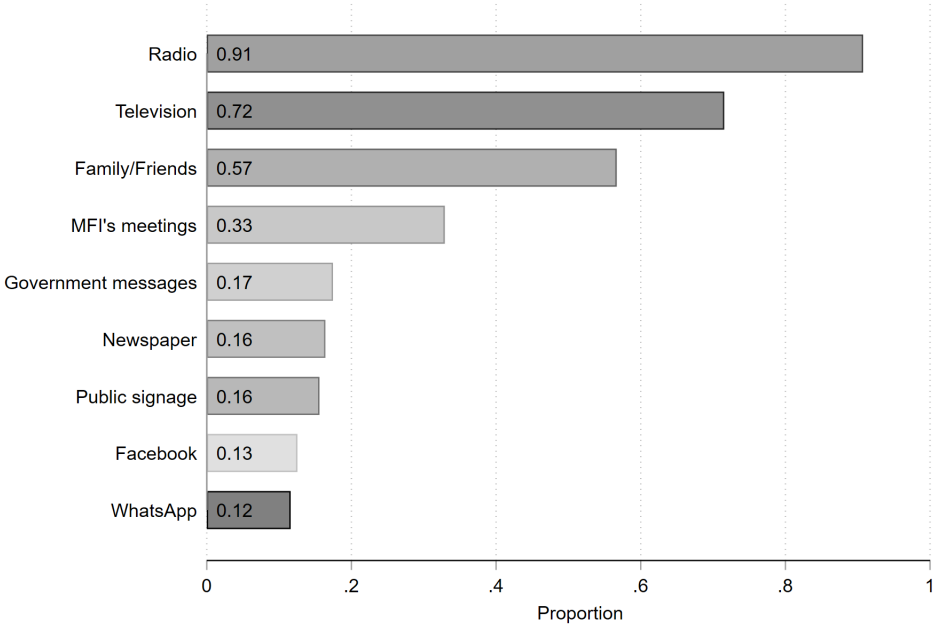
[14]Using user's history data from mobile device location applications (such as Google Maps), Google aggregates anonymized datasets and publicly provides population movements throughout the pandemic. The data shows how visits to places, such as grocery stores and parks, are changing in each geographic region. Each day, the number of visitors to specific categories of places (e.g., grocery stores, parks, train stations) is measured and compared to a baseline day (estimated before the start of the pandemic over the five weeks from January 3 to February 6, 2020).

The remaining part of this Appendix B presents some descriptive statistics regarding the sources of information used by the respondents, their perceptions of the coronavirus crisis, and its impact on daily life.

Sources and types of information

Figure B2 shows the main sources of information used by respondents to keep up to date with Covid-19 and the measures and restrictions put in place by the government. Almost all respondents (91%) were getting information from listening to the radio and most (72%) from watching television. Official government messages (17%) and public signage (16%) were relatively unused communication channels. On the other hand, 33% of respondents got their information from meetings organized by MFIs. Physical and online social networks played an important role: 57% of respondents obtained information by talking with friends and family, and 12% and 13% through WhatsApp and Facebook.

Figure B2: Main sources of information about the coronavirus



More generally, 96% used an official source of information (government message, newspapers, radio, television, public signage), 66% exchanged information through discussions with family and friends

or at MFI meetings, and 14% through online social networks (Table B2). Most respondents use multiple sources of information. Only 11% use only one source, while 28% use two sources of information, 37% use three, and 24% use at least four. They also diversify the type of media they use, with only one-third of respondents getting their information exclusively from official channels and 4% only from discussions. It should be noted that over-information or diversification of information sources does not necessarily mean that the respondent will change their behavior. Indeed, some official messages were contradictory (e.g., those about wearing masks), and several false rumors (about the very existence of the virus or the immunity of blacks) circulated, which may have led to misinformation among respondents.

Table B2: Main sources of information about the coronavirus

	Obs.	Freq.
Information sources		
Official[1]	821	96.14
Discussions[2]	559	65.46
Online social networks[3]	117	13.70
Official[1] only	275	31.01
Discussions[2] only	30	3.51
Online social networks[3] only	0	0.00
Number of sources of information used		
1	94	10.79
2	240	28.10
3	313	36.65
4+	201	23.53

Note: [1]Government messages, newspapers, radio, television, public signage. [2]Discussions within family, friends or at MFI's meetings. [3]WhatsApp and Facebook.

Concerns about Covid-19

The main concerns about the coronavirus crisis are primarily health-related (Table B3): 78% are afraid of contracting the disease and 58% are afraid of a family member contracting it. These concerns are considered the most worrisome (35% and 20% respectively). In addition, half of those surveyed (47%) said they fear the spread of the disease. 16% of people consider this to be the most

important concern. To a lesser extent, respondents also express concerns related to daily economic life: they fear not having enough money for food (36%), health care (29%) or credit (27%). Finally, a sizable proportion of respondents have more general concerns, such as fearing that they will no longer be able to travel (24%) or that the economy will collapse (21%). While most respondents express only one or two concerns (12% and 33%, respectively), a significant proportion (10%) say they are concerned about all the concerns mentioned.

Table B3: Main concerns regarding the coronavirus crisis

	One concern		The most worrying concern	
	Obs.	Freq.	Obs.	Freq.
Contracting the disease	669	78.34	302	35.52
A family member contract the disease	499	58.43	175	20.11
The disease spread everywhere	403	47.19	138	16.18
Lack of money for food	305	35.71	72	8.44
Lack of money for health care	248	29.04	42	4.92
Lack of money for repay loans	230	26.93	58	6.67
Travel restrictions	201	23.54	32	3.75
The economy's collapse	175	20.49	28	3.28
Other	9	0.93	1	0.12

The impacts of Covid-19 on daily life

The coronavirus crisis in Burkina Faso has impacted respondents' daily economic conditions. 35% of respondents regularly faced difficulties in obtaining food (several times during the period or systematically). In addition, 6% mentioned frequent shortages of drinking water and 5% cited shortages of medicine or difficulties accessing medical care (Table B4). In addition, 54% of respondents reported frequent restrictions in their economic activities and 7% reported systematic restrictions. When we asked respondents to self-assess their current living conditions in comparison to those of other Burkinabe (Table B5), the majority of individuals consider themselves to be in a better (52%) or much better (12%) situation than the rest of the population. However, more than a quarter of the respondents think their living conditions are worse (27%) or much worse (5%) than the rest of the population. Besides, 42% and 21% of respondents anticipated the economic conditions to improve in the year following the survey.

Table B4: Impacts of Covid-19 on daily life

	Insufficient food	Lack of drinking water	Lack of medication or medical care	Restrictions on economic activities
Never	45.12	79.15	84.64	20.47
Just once or twice	20.45	14.25	10.81	18.12
Several times	32.90	4.27	2.99	54.63
Always	1.53	2.33	1.56	6.78
At least once	54.88	20.85	14.36	79.53
Obs.	851	772	768	767

Table B5: Self-assessment of respondents' living conditions

How would you describe your current living conditions compared to those of other Burkinabes?

	Obs.	Freq.
Much Worse	45	5.28
Slightly worse	233	27.35
Same	24	2.82
Slightly better	444	52.11
Much better	106	12.44

Appendix C: Risk and time preference measurement

Figure C1: Elicitation of risk attitudes in the gain domain

Table C1: Measurement of risk attitudes in the gain domain

	Scenario 1	Scenario 2	Scenario 3
0- Low risk aversion	B	B	B
1	B	B	A
2	B	A	A
3- High risk aversion	A	A	A

Figure C2: Elicitation of risk attitudes in the loss domain

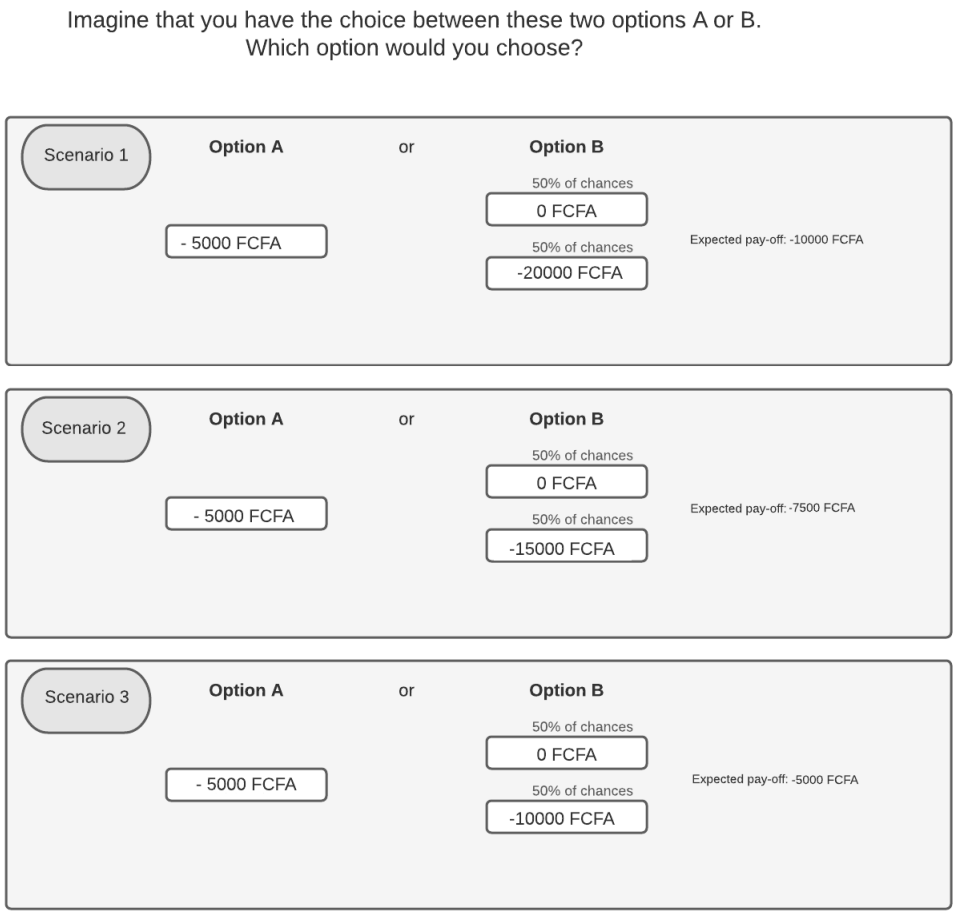


Table C2: Measurement of risk attitudes in the loss domain

	Scenario 1	Scenario 2	Scenario 3
0- Low risk aversion	B	B	B
1	B	B	A
2	B	A	A
3- High risk aversion	A	A	A

Figure C3: Elicitation of impatience

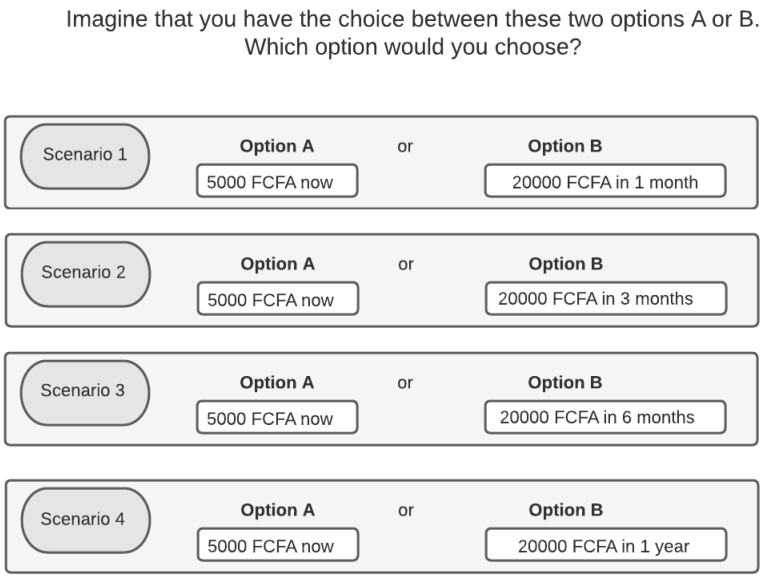


Table C3: Measurement of impatience

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
0- High patience	B	B	B	B
1	B	B	B	A
2	B	B	A	A
3	B	A	A	A
4- High impatience	A	A	A	A

Appendix D. Robustness checks

Table D1: Effect of Covid-19 crisis on risk aversion - gain domain

	Binary outcome				Categorical outcome			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post Covid-19	0.090***	0.090***	0.090***	0.098***	0.274***	0.274***	0.277***	0.296***
	(0.020)	(0.022)	(0.019)	(0.021)	(0.058)	(0.056)	(0.056)	(0.061)
Preference for present	0.131***	0.131***	0.172***	0.122**	0.337**	0.337**	0.497***	0.336**
	(0.039)	(0.033)	(0.030)	(0.040)	(0.112)	(0.113)	(0.087)	(0.117)
Relative effects (%)	12.04	12.04	12.04	13.11	12.10	12.10	12.23	13.07
Nb. Observations	1572	1572	1568	1481	1572	1572	1568	1485
Robust standard errors	✓		✓	✓	✓		✓	✓
Bootstrapped standard errors		✓				✓		
Individual fixed-effect	✓	✓		✓	✓	✓		✓
Random fixed-effect			✓				✓	
Preference for present	✓	✓	✓	✓	✓	✓	✓	✓
Time-varying controls			✓				✓	
Sample: non-anxious people				✓				✓

Authors' estimates for the period January 2020 to June 2020.

Post Covid-19 is a dummy variable indicating the second wave (June 2020).

Time-varying controls include employment status, age, education level, standard of living, number of people living in the household and subjective health status.

Mean risk attitudes in January 2020 (dummy): 74.73. Mean risk attitudes in January 2020 (categorical): 2.26.

Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

Table D2: Effect of Covid-19 crisis on risk aversion - loss domain

	Binary outcome				Categorical outcome			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post Covid-19	-0.283***	-0.283***	-0.290***	-0.271***	-0.901***	-0.901***	-0.916***	-0.866***
	(0.025)	(0.025)	(0.024)	(0.026)	(0.075)	(0.065)	(0.071)	(0.077)
Preference for present	-0.004	-0.004	0.048	-0.002	0.017	0.017	0.170	0.024
	(0.048)	(0.043)	(0.032)	(0.050)	(0.143)	(0.138)	(0.094)	(0.147)
Relative effects (%)	-47.06	-47.06	-48.22	-45.06	-48.37	-48.37	-49.18	-46.49
Nb. Observations	1564	1564	1561	1481	1564	1564	1561	1481
Robust standard errors	✓		✓	✓	✓		✓	✓
Bootstrapped standard errors		✓				✓		
Individual fixed-effect	✓	✓		✓	✓	✓		✓
Random fixed-effect			✓				✓	
Preference for present	✓	✓	✓	✓	✓	✓	✓	✓
Time-varying controls			✓				✓	
Sample: non-anxious people				✓				✓

Authors' estimates for the period January 2020 to June 2020.

Post Covid-19 is a dummy variable indicating the second wave (June 2020).

Time-varying controls include employment status, age, education level, standard of living, number of people living in the household and subjective health status.

Mean risk attitudes in January 2020 (dummy): 60.14. Mean risk attitudes in January 2020 (categorical): 1.86.

Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

Table D3: Effect of coronavirus crisis on impatience

	Binary outcome				Categorical outcome			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post Covid-19	0.074***	0.074***	0.069***	0.067**	0.266***	0.266***	0.263***	0.244***
	(0.020)	(0.018)	(0.019)	(0.021)	(0.062)	(0.059)	(0.059)	(0.064)
Risk aversion (gains)	0.126***	0.126**	0.168***	0.114**	0.440***	0.440**	0.635***	0.396**
	(0.037)	(0.035)	(0.029)	(0.038)	(0.124)	(0.125)	(0.099)	(0.125)
Relative effects (%)	9.69	9.69	9.04	8.78	8.38	8.38	8.29	7.69
Nb. Observations	1572	1572	1568	1481	1551	1551	1547	1461
Robust standard errors	✓		✓	✓	✓		✓	✓
Bootstrapped standard errors		✓				✓		
Individual fixed-effect	✓	✓		✓	✓	✓		✓
Random fixed-effect			✓				✓	
Risk aversion (gain)	✓	✓	✓	✓	✓	✓	✓	✓
Time-varying controls			✓				✓	
Sample: non-anxious people				✓				✓

Authors' estimates for the period January 2020 to June 2020.

Post Covid-19 is a dummy variable indicating the second wave (June 2020).

Time-varying controls include employment status, age, education level, standard of living, number of people living in the household and subjective health status.

Mean preference for present in January 2020 (dummy): 76.35. Mean preference for present in January 2020 (categorical): 3.33.

Robust standard errors in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

Table D4: Covid-19 on preferences: Heterogeneity according to the sources of media

	Sources of information used				**Distrust in source of information**			
	Prevalence	Risk aversion	Loss aversion	Impatience	Prevalence	Risk aversion	Loss aversion	Impatience
Government	0,173	0.137**	−0.147*	0.062	0,013	−0.154*	0.468***	−0.147
		(0.050)	(0.062)	(0.045)		(0.072)	(0.089)	(0.090)
Media								
Newspapers	0,165	0.081	−0.281***	0.077	0,055	0.096	0.152	−0.167*
		(0.054)	(0.057)	(0.051)		(0.142)	(0.127)	(0.077)
Radio	0,905	−0.017	−0.070	−0.077	0,038	0.197	0.040	0.091
		(0.067)	(0.082)	(0.061)		(0.189)	(0.185)	(0.174)
Television	0,716	0.042	−0.090	−0.015	0,054	−0.107	−0.063	0.175
		(0.041)	(0.054)	(0.043)		(0.168)	(0.213)	(0.215)
Public signage	0,156	0.112*	−0.328***	0.085	0,360	−0.258*	0.090	−0.223*
		(0.049)	(0.055)	(0.046)		(0.100)	(0.125)	(0.087)
Family/Friends/Neighbors								
Family/friends	0,568	0.033	0.088	−0.053	0.016	0.078	0.238	−0.293
		(0.094)	(0.126)	(0.089)		(0.212)	(0.264)	(0.202)
Toond Laafi Meeting	0.330	0.004	−0.034	0.069	0,011	−0.287***	0.620***	−0.216***
		(0.042)	(0.052)	(0.041)		(0.062)	(0.064)	(0.060)
WhatsApp	0,116	0.180**	−0.314***	0.122*	0,518	−0,02	0,173	−0.096
		(0.055)	(0.060)	(0.051)		(0.106)	(0.109)	(0.098)
Facebook	0,125	0.137**	−0.337***	0.139**	0,694	−0.203	−0.016	−0.044
		(0.051)	(0.057)	(0.049)		(0.120)	(0.120)	(0.112)

Standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

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