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Abstract

We study the stability of noncognitive skills by comparing experimental results gathered before and during the COVID-19 pandemic. Using a sample of professional traders, we find a significant decrease in agreeableness and locus of control and a moderate decrease in grit. These patterns are primarily driven by those with more negative experiences of the pandemic. Other skills, such as trust, conscientiousness, and self-monitoring, are unchanged. We contrast these results with those from a sample of undergraduate students whose noncognitive skills remain constant (except conscientiousness). Our findings provide evidence against the stability of noncognitive skills, particularly among professional traders.

Key words: noncognitive skills, COVID-19, professional traders

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1 Introduction

Noncognitive skills play a crucial role for economic and social outcomes (for a survey, see Almlund et al., 2011). They are predictive of educational achievement (Van Eijck and De Graaf, 2004; Borghans et al., 2016), job-searching effort (Caliendo et al., 2015), the likelihood of finding a job (Cobb-Clark and Tan, 2011), job performance (Rustichini et al., 2016), wage levels (Heckman et al., 2006; Fletcher, 2013), and long-term health (Roberts et al., 2007).

In the literature, noncognitive skills are typically treated as stable characteristics that do not vary with life events or the business cycle. This traditional approach views personality traits as considerably stable after they are formed early in life (McCrae and Costa, 1994), although variations have been observed during the life cycle of an individual (see Section 1.1 below). More recent empirical studies, however, cast doubts on the stability of noncognitive skills (Hoeschler et al., 2018). In particular, frightening shocks in everyday life (Löckenhoff et al., 2009) or long-term health problems (Elkins et al., 2017) can significantly alter noncognitive skills. Given the role of these skills in determining economic outcomes, it is important to understand whether they are stable or vary over time in response to economic shocks or substantial changes in life circumstances.

In this paper, we elicit and analyze noncognitive skills for a sample of professional traders and portfolio managers. To the best of our knowledge, we are the first to document the noncognitive skills of professional traders and portfolio managers. Our main contribution is to assess the stability of their noncognitive skills at the onset of the COVID-19 pandemic. To the extent that noncognitive skills influence economic decisions, changes in noncognitive skills induced by the pandemic within this important group of economic agents may contribute to explain changes in economic outcomes in response to other major shocks.

For this purpose, we run an experiment with a sample of professional traders during the COVID-19 pandemic of 2020. We also use a sample of undergraduate students to gauge whether noncognitive skills of different segments of the population reacted differently to the pandemic events.¹ COVID-19 is arguably the biggest shock to developed economies since World War II. The pandemic disrupted economic activity to an extreme degree for a time of peace. At the time of the study, in April 2020, entire countries were under lockdown. Excess deaths in the first part of the year were estimated to be large, with healthcare systems unable to cope with the coronavirus outbreak. The IMF forecasted 2020 real GDP to decrease by 7.1% in the European Union and by 5.9% in the U.S. In April 2020, the unemployment rate reached 14.7% in the U.S. and 6.7% in the European Union. Asset prices responded accordingly, with the NYSE depreciating by about 20% between February and April. The effect of the pandemic is not limited to the economy. Entire countries were under lockdowns with severe restrictions, schools were closed, and mortality rates climbed dramatically.

We conduct an experiment with *the same* samples of professional traders and students before the COVID-19 pandemic (between February and May 2019) and after its onset (April 2020). Before the pandemic, in 2019, we ran a laboratory experiment in which participants answered a series of questions assessing their noncognitive skills; in particular, we elicited Agreeableness

¹For a review of differences between students and financial professionals in economic experiments, see Fréchette (2015).

(which includes Trust), Conscientiousness, Locus of Control, Grit, and Self-Monitoring. In April 2020, we invited the same participants to repeat these tasks and asked additional questions to gauge the extent to which the events induced by the COVID-19 pandemic were affecting them.²

We focus on the five noncognitive skills mentioned above, which have shown to be relevant for strategic decision making and economic outcomes. For instance, Proto et al. (2019) study the relationship between Agreeableness, and Conscientiousness, and strategic behavior. Biais et al. (2005) find that Self-Monitoring enhances trading performance. Caliendo et al. (2015) investigate the role of Grit and Locus of Control in informing economic decisions, such as job search strategies. Noncognitive skills have also proved to affect financial outcomes. For instance, Arellano et al. (2015), show that differences in noncognitive skills explain heterogeneity in financial literacy across gender. Furthermore, noncognitive skills predict financial fragility: compared to people in the top quintile of noncognitive abilities, people in the bottom quintile are ten times more likely to experience financial distress (Parise and Peijnenburg, 2019). Among the Big 5 personality traits, Conscientiousness has been found to be negatively associated with measures of financial distress (Xu et al., 2015). Finally, individuals with high self-efficacy (a concept related to Locus of Control) are more likely to take precautions that mitigate adverse financial shocks, making them less likely to default on their debt and bill payments (Kuhnen and Melzer, 2018).

We find that professional at the onset of the COVID-19 pandemic traders showed a significant decrease in Agreeableness and Locus of Control, a moderate reduction in Grit, and no changes in Trust, Conscientiousness, or Self-Monitoring. In contrast, undergraduate students' noncognitive skills remained constant, except for Conscientiousness, which increased. Therefore, our findings, particularly those based on the sample of professional traders, do not support the view that noncognitive skills are generally stable and do not respond to major economic shocks and life events.

Finally, we investigate whether changes in participants' noncognitive skills are related to their experience of the pandemic. Consistent with our main results, we find that traders with a more negative experience of the pandemic were more likely to decrease their Agreeableness, Grit, and Locus of Control levels.

1.1 Related literature

Only few studies have analyzed the effect of social and economic disruptions, such as those caused by the COVID-19 pandemic, on personality traits, which are typically considered to be stable, at least after young adulthood (McCrae and Costa, 1994).³ Some recent contributions, however, suggest that personality traits may change with age and life experiences. For instance, Conscientiousness and Agreeableness have been shown to vary over an individual's lifetime (see Roberts et al. (2006) for a meta-analysis). Extreme physical or psychological trauma can also alter personality traits: Löckenhoff et al. (2009) find that suffering a frightening experience can decrease Agreeableness, whereas Elkins et al. (2017) show that long-term health conditions can reduce Locus of Control. In contrast, Cobb-Clark and Schurer (2012, 2013)

²According to the taxonomy of Harrison and List (2004), our study is an artefactual field experiment.

³We follow Heckman and Rubinstein (2001) and lump different personality and motivational traits into the category of noncognitive skills.

document very limited changes in noncognitive skills, such as Locus of Control, Agreeableness, and Conscientiousness, even after experiencing adverse events.

Also related to our work are papers in the Social Capital literature that discuss the stability of Trust. Using survey data from the U.S. and other countries, Stevenson and Wolfers (2011) show a procyclical trend in trust in national governments and financial institutions. Ananyev and Guriev (2019) exploit the differential effect of the 2009 financial crisis across Russian regions to study the effect of the crisis on societal trust; they estimate that a 1% drop in income reduces the level of trust by 0.5%. Guriev and Melnikov (2016) use weekly online searches for keywords related to social capital (e.g., blood donations, adoptions and charity) to assess changes in social capital in Russia in 2014, which they attribute to changes in inflation and the escalation of the armed conflict against Ukraine.⁴ Using longitudinal data, Algan et al. (2017) find a substantial decrease in trust in institutions as a result of the increase in unemployment during the 2008 financial crisis in Europe, but a much smaller reduction in interpersonal trust. Owens and Cook (2013) present similar results for the U.S. Lindström and Giordano (2016) find a significant decrease in generalized trust in the U.K. at the time of the 2008 financial crisis.

The rest of the paper is organized as follows. Section 2 explains the experiment. Section 3 describes the participant sample. Section 4 presents the results. Section 5 concludes. An appendix contains additional results and the experimental instructions.

2 The Experiment

2.1 Setup

We ran our experiment twice. The first time, between February and May 2019, we conducted an in-person experiment in the Experimental Laboratory for Finance and Economics (ELFE) in the Centre for Finance at the Department of Economics at University College London (UCL). The second time, in April 2020, we conducted the same experiment online.

In 2019, we elicited participants' noncognitive skills via z-tree (Fischbacher, 2007).⁵ In April 2020, we invited *the same participants* to an online experiment run with o-Tree (see Chen et al., 2016), during which we elicited noncognitive skills using the same battery of questions as in 2019. Furthermore, we asked participants to complete a questionnaire about the impact of the COVID-19 pandemic on their lives.

In April 2020, the UK reported more than 100,000 cases of COVID-19 resulting in more than 15,000 deaths. London and the rest of the UK were locked down so that people were only allowed to leave their home for specific reasons and for a short time period. Universities were closed and teaching was exclusively remote. For most jobs, working from home had become the norm. We refer to the data gathered in 2019 as the "Pre-COVID" data and to the data gathered in 2020 as the "COVID" data.

In both sets of data, we measure five noncognitive skills: Agreeableness (which includes a

⁴Other related contributions include Fisman et al. (2015) who study the behavior of undergraduate students in the dictator game and document that, after the 2008 financial crisis, there were higher levels of selfishness and preferences for efficiency.

⁵These data are part of a larger experimental project on trading activity by financial market professionals and students (see Angrisani et al., 2022; Cipriani et al., 2020).

measure of Trust; see John et al., 1991), Conscientiousness, Locus of Control, Grit and Self-Monitoring.⁶

Our samples for both professional traders and students include only individuals who participated in both experiments.

2.2 Noncognitive Skills

As mentioned above, we focus on five noncognitive skills: Agreeableness, Conscientiousness, Locus of Control, Grit, and Self-monitoring. For the first four traits, participants are asked to what extent they agree with a series of statements using a scale ranging from 1 (Disagree strongly) to 5 (Agree strongly). For Self-Monitoring, participants answer 18 true/false questions (coded as 0 or 1). These tasks are not incentivized.

2.2.1 Agreeableness

We measure Agreeableness by using the two-item assessment developed by Rammstedt and John (2007), consisting of the following two statements:

- *I am generally trusting.*
- *I tend to find fault with others.*

The second item is reverse coded and Agreeableness is the average of the two items. Higher values of this measure represent higher Agreeableness.

The first item is a measure of trust, also adopted (verbatim) by the U.S. General Social Survey and the European Social Survey.⁷ This measure has been used to study how trust is linked to financial decisions (Karlan, 2005), economic performance (Butler et al., 2016) and economic shocks (Ananyev and Guriev, 2019).

2.2.2 Conscientiousness

As with Agreeableness, we measure Conscientiousness by using the two-item assessment of Rammstedt and John (2007) consisting of the following two statements:

- *I do a thorough job.*
- *I tend to be lazy.*

The second item is reverse coded and Conscientiousness is the average of the two items. Higher values of this measure represent higher Conscientiousness.

⁶In addition to these measures, we elicited other traits, whose relation with economic decisions and outcomes has not been unequivocally established in the literature (e.g., Openness, Extroversion, Neuroticism of the Big-5). We find no evidence that these traits changed between the time before the COVID-19 pandemic and its onset. In the interest of space, we do not report these results in the paper, but can provide them upon request.

⁷A different, but similar wording is used in the World Values Survey (WVS) to elicit individuals' trust: "Generally speaking, do you believe that most people can be trusted or that you can't be too careful in dealing with people?" An alternative approach to measure trust consists in asking individuals to play the "Trust Game" (Berg et al., 1995). A subject's behavior in this game, however, may depend on both beliefs and preferences (see Gale, 2005 and Sapienza et al., 2013).

2.2.3 Locus of Control (LoC)

We measure Locus of Control (LoC from now on) by using the 7-item questionnaire developed by Cobb-Clark and Schurer (2013). Participants are asked to what extent they agree with the following statements:

- *What happens to me in the future mostly depends on me.*
- *I can do just about anything I really set my mind to do.*
- *I have little control over the things that happen to me.*
- *There is really no way I can solve some of the problems I have.*
- *I often feel helpless in dealing with the problems of life.*
- *Sometimes I feel that I'm being pushed around in life.*
- *There is little I can do to change many of the important things in my life.*

LoC is the average of these 7 items, with higher values representing higher internal LoC.

2.2.4 Grit

We measure Grit using the 8-item questionnaire (GRIT-S) developed by Duckworth and Quinn (2009):

- *Setbacks don't discourage me.*
- *I finish whatever I begin.*
- *I am diligent.*
- *I am a hard worker.*
- *I often set a goal but later choose to pursue a different one.*
- *New ideas and projects sometimes distract me from previous ones.*
- *I have been obsessed with a certain idea or project for a short time but later lost interest.*
- *I have difficulty keeping my focus on projects that take more than a few months to complete.*

Grit is the average of these eight items, with higher values representing higher Grit.

2.2.5 Self-Monitoring

We measure Self-Monitoring using the 18-item questionnaire developed by Snyder and Gangestad (1986). We list two items here and report all 18 items in the Appendix:

- *I find it hard to imitate the behaviour of other people.*
- *At parties and social gatherings, I do not attempt to do or say things that others will like.*

To calculate Self-Monitoring, we compute the proportion of times a participant's choice aligns with the higher Self-Monitoring answer. This measure takes a value between 0 and 1, with higher values representing higher Self-Monitoring.

2.3 Perceived Impact of the Pandemic

In the COVID experiment, we ask participants to answer a questionnaire about their experience of the pandemic. Specifically, individuals report: i) whether they or members of their household had been infected; ii) whether any relative or close friend had been infected; iii) the impact of the pandemic on their current financial situation; iv) their expectations about the impact of the pandemic on their financial situation in one year; v) the extent to which their quality of life had been affected by changes in daily activities; vi) how worried they were about the pandemic in general. Questions iii) to vi) are measured on a Likert scale from 1 (Not at all) to 5 (Severely).

3 Experimental Subjects

Our samples consist of traders and portfolio managers working in the city of London (UK) and of UCL undergraduate students from all disciplines.

In 2019, we recruited 56 professional traders and 79 undergraduate students. Out of the original participants, 49 traders and 61 students participated again in 2020, for a participation rate of 88% among professional traders and 77% among students. As mentioned above, our sample includes only those who participated in both the 2019 and the 2020 experiments.

The sample of professional traders consists of 28 traders, 4 proprietary traders, 2 sales-traders, 9 portfolio managers, and 6 belonging to other categories (e.g., trading strategist or sales with management of virtual portfolios). Professional traders work in a variety of financial markets, such as equity, equity derivatives, FX, fixed income, and commodities. Twenty-seven participants are employed by an investment bank, 11 by an investment fund and the others by other types of institutions (or preferred not to report their employer). Traders' age ranges between 24 and 50, with a mean of 33 years and a standard deviation of 6.5 years. Their average job tenure is 9.4 years, with a range between 1.5 and 21 years and a standard deviation of 5.7 years. Thirty participants have a Master degree, 4 an MBA, and 14 a Bachelor degree.⁸ Thirty participants studied economics or finance, 8 mathematics or physics, 8 engineering or computer science; the remainder of the sample have a degree in other disciplines or did not declare it. Eighty-six percent of traders are men.

The sample of students comprises undergraduate students from all disciplines. The gender composition is similar to that of traders, with 80% of students being male.⁹ Students are younger than traders, with a mean of 22 years and a standard deviation of 1.7.

4 Results

We first consider changes in our five noncognitive skills in Subsection 4.1. We then look at differences in the impact of the COVID-19 pandemic on participants' lives in Subsection 4.2 and at the extent to which they are reflected in changes in noncognitive skills in Subsection 4.3.

⁸One participant declared both a Master degree and an MBA. Two participants did not declare their highest level of education.

⁹Because gender may play a role in many experiments, we recruited students in order to match the gender composition of our trader pool.

4.1 Noncognitive skills

Tables 1 and 2 report the mean, median, and standard deviation of noncognitive skills in the Pre-COVID and COVID data for traders and students.

In the Pre-COVID data, the two samples of participants exhibit similar levels of Agreeableness and Self-Monitoring. Using a two-tailed t-test for the equality of means and allowing for unequal variances between groups, we fail to reject the null that, on average, traders and students have the same Agreeableness and Self-Monitoring (p-values = 0.695 and 0.372). On the other hand, the two samples of participants differ significantly with respect to the other three noncognitive skills, with traders showing higher levels of Conscientiousness, LoC and Grit than students (p-values = 0.002 for Conscientiousness and less than 0.001 for LoC and Grit).

Previous studies suggest that noncognitive skills may change over the life cycle. In a meta-analysis of 92 studies, Roberts et al. (2006) observe positive and statistically significant changes for Conscientiousness in early adulthood (from 20 to 30, from 30 to 40 and from 40 to 50), while Agreeableness significantly increases only later in life (between 50 and 60). In a longitudinal study, Gatz and Karel (1993) show that LoC significantly increases with age. In cross-sectional studies, Duckworth et al (2007) find a monotonic increase in Grit with age, while Reifman et al. (1989) document that Self-monitoring significantly decreases with age. In contrast to these findings, for both traders and professional students, we do not find evidence that age affects any of the five noncognitive skills (see Appendix B).

Table 1: Traders’ Noncognitive Skills in the Pre-COVID and COVID data

	Pre-COVID Data			COVID Data			$H_0 : E[\Delta Y] = 0$
	Mean	SD	Med	Mean	SD	Med	p-value
Agreeableness	3.27	0.89	3.50	3.00	0.93	3.00	0.009
Conscientiousness	3.81	0.86	4.00	3.92	0.70	4.00	0.242
Locus of Control	4.32	0.52	4.43	4.11	0.52	4.28	0.005
Grit	3.74	0.66	3.75	3.62	0.56	3.62	0.102
Self-monitoring	0.53	0.21	0.50	0.50	0.24	0.55	0.192

Note: ΔY is the individual-level change in noncognitive skill Y between the COVID and the Pre-COVID data. *: p -value < 0.1, **: p -value < 0.05, ***: p -value < 0.01.

To study whether noncognitive skills have changed during the pandemic, we measure the difference of each skill between the Pre-COVID and COVID data sets:

$$\Delta Y = (Y_{COVID} - Y_{Pre-COVID})$$

with $Y = \{Agreeableness, Conscientiousness, Locus\ of\ Control, Grit, Self - Monitoring\}$

and use a two-tailed t-test for the null hypothesis that the average change across the two data sets is zero (our results are the same when using a Wilcoxon signed-rank test). The p-values of the test are reported in the last column of Tables 1 and 2.

Table 2: Students' Noncognitive Skills in the Pre-COVID and COVID data

	Pre-COVID Data			COVID Data			$H_0 : E[\Delta Y] = 0$
	Mean	SD	Med	Mean	SD	Med	p-value
Agreeableness	3.20	0.98	3.50	3.14	0.94	3.00	0.512
Conscientiousness	3.40	0.71	3.50	3.63	0.68	3.50	0.005
Locus of Control	3.91	0.70	4.00	3.84	0.74	4.00	0.281
Grit	3.31	0.71	3.37	3.37	0.72	3.50	0.372
Self-monitoring	0.56	0.19	0.55	0.59	0.22	0.61	0.179

Note: ΔY is the individual-level change in noncognitive skill Y between the COVID and the Pre-COVID data. *: p -value < 0.1, **: p -value < 0.05, ***: p -value < 0.01.

Traders decrease their Agreeableness by 0.27 (8.4% of the Pre-COVID average, p -value = 0.009) and LoC by 0.21 (4.7% of the Pre-COVID average, p -value = 0.005). Traders also show a reduction in Grit, although this is of borderline significance (p -value = 0.102). The changes in Conscientiousness and Self Monitoring are not statistically different from zero (p -values = 0.242 and 0.192).

For students, we observe a significant increase in Conscientiousness by 0.23 (7% of the Pre-COVID average, p -value = 0.005), but no significant changes in Agreeableness, LoC, Grit, and Self-Monitoring.

It is interesting to note that for any of the noncognitive skills we do not observe one group increasing its mean value and the other decreasing it in a significant way. When we observe significant changes, they are never in opposite directions. At the time of the COVID-19 pandemic, the two samples of participants become more similar for most skills. In particular, the gaps between traders and students in terms of LoC and Grit, although still statistically significant, are reduced by about one-third. Importantly, noncognitive skills are highly and significantly correlated between their Pre-COVID and COVID level. For traders (students), the correlation between Pre-COVID and COVID measures are 0.70 (0.67) for Agreeableness, 0.65 (0.61) for Conscientiousness, 0.56 (0.77) for LoC, 0.70 (0.76) for Grit, and 0.81 (0.75) for Self-Monitoring; correlations are significant at the 1% level.

One may wonder about the economic significance of the changes that we observe in traders' Agreeableness and LoC and in students' Conscientiousness. Heineck and Anger (2010) have estimated the percent change in wages induced by a one standard deviation increase in these noncognitive skills. Based on their estimates and our data, we calculate that the decrease in traders' LoC observed results in a 3% decrease in wage. The impact of the observed decrease in traders' Agreeableness is more modest, amounting to an increase in wage of 0.7%. For students, the observed increase in Conscientiousness implies a wage increase of 0.6%. Danner et al. (2019) study the association between Grit and relative personal income across countries. Using their estimates, the detected decrease in Grit among traders, which is only marginally significant, would imply a 0.9 percentage point decrease in relative income.

As mentioned above, one of the questions in our Agreeableness measure also captures Trust.

Trust is an important aspect of Social Capital (Guiso et al., 2011), and there exists empirical evidence that a decrease in income or an increase in unemployment negatively affects Trust. In our data, Trust decreases by 6% among traders and remains virtually constant among students. Even for traders, though, the observed change is not statistically significant (two-tailed t-test, p-value = 0.142). Thus, we see only weak evidence that Trust decreased at the onset of the COVID-19 pandemic.

Throughout this analysis, we attribute any change in noncognitive skills between the Pre-COVID (February-May 2019) and the COVID (April 2020) data collection times to the COVID-19 pandemic. We believe that this interpretation is plausible since the COVID-19 pandemic is an event of such magnitude that its impact should dwarf any change due to other intervening factors. Nevertheless, we perform a robustness check to back this interpretation. As part of a different experiment, we collected data on noncognitive skills for an additional pool of 34 students (Cavacorta et al., 2020). These data were collected for the same sample of subjects in November-December 2019 and again in April 2020. Hence, for this additional sample of 34 students, the Pre-COVID data refer to the end of 2019, rather than to the first half of 2019. The shorter time gap between the Pre-COVID and COVID data collection times should reduce concerns about possible confounding effects introduced by other macroeconomic or societal events. Thus, if our findings are largely driven by the COVID-19 pandemic, we expect the results for these 34 students to be similar to those in our main sample. This is indeed the case. Similarly to the sample of students in our main analysis, these additional 34 students exhibit no sizable and statistically significant changes in Agreeableness, Locus of Control, Grit or Self-Monitoring. The only difference is observed for Conscientiousness, which increases significantly in our main student sample; among the additional 34 students, the increase was not significant (see Table A.2 in Appendix D). This difference, however, is driven by the different gender composition of these two samples (see Table A.3 in Appendix D).¹⁰

4.2 Heterogeneous Impact of the COVID-19 Pandemic

As discussed in Section 2, in the COVID experiment, participants also filled out a questionnaire about their experience with the COVID-19 pandemic.

Figure 1 reports the distribution of responses to two questions. The top panel shows the proportion of participants who report that they, or someone in their household, have been infected with COVID-19. The bottom panel shows the proportion of participants who report having a relative or close friend infected with COVID-19.¹¹ Among all participants, 4.5% mention that they, or someone in their household, have been infected with COVID-19, whereas about one-quarter have relatives or close friends infected with COVID-19.¹²

¹⁰The main student sample is 80% male to match the gender composition of the traders' sample. Since the additional 34 students were recruited for a different experiment, we did not match the gender composition of traders. This sample is 40% male. As can be seen in Table A.3 in Appendix D, male students significantly increase Conscientiousness, while female students do not.

¹¹For context, note that a home antibody testing study by Ward et al. (2020) showed that 6% of the population in England (13% in London) had been infected by COVID-19 by the end of June 2020. A majority of those infected by this date reported symptoms in March and April 2020.

¹²Among traders, 6% report own or household members' infection; among students, this fraction is 3%. The difference is not statistically significant (p-value=0.495). Among traders, 39% report infection of relatives or close friends; among students, this fraction is 13%. The difference is statistically significant (p-value=0.003).

Figure 1: Impact of the COVID-19 Pandemic (I)

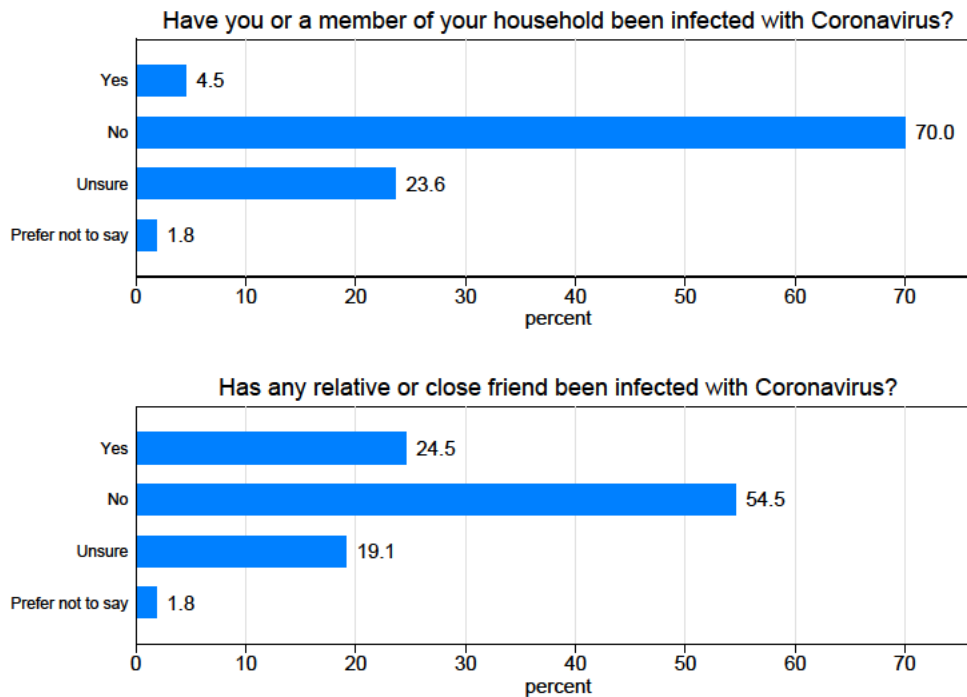


Figure 2 shows statistics on the impact of the pandemic on participants' lives. One-quarter of the participants state that their current financial situation has been either moderately or severely affected, whereas 36% state that it has not been impacted at all. About 40% think that their future financial situation will be negatively affected, whereas 15.5% believe that their finances will not be impacted at all in the future.¹³ There is a large consensus among participants about how the pandemic impacted their quality of life. For approximately 70% of participants, disruption of regular activities has either moderately or severely affected their quality of life; only 5.5% of participants state that their quality of life has not been affected at all. About 46% of participants are very worried about the pandemic and 8% are not worried at all.¹⁴

4.3 Experience of the COVID-19 Pandemic and Changes in Noncognitive Skills

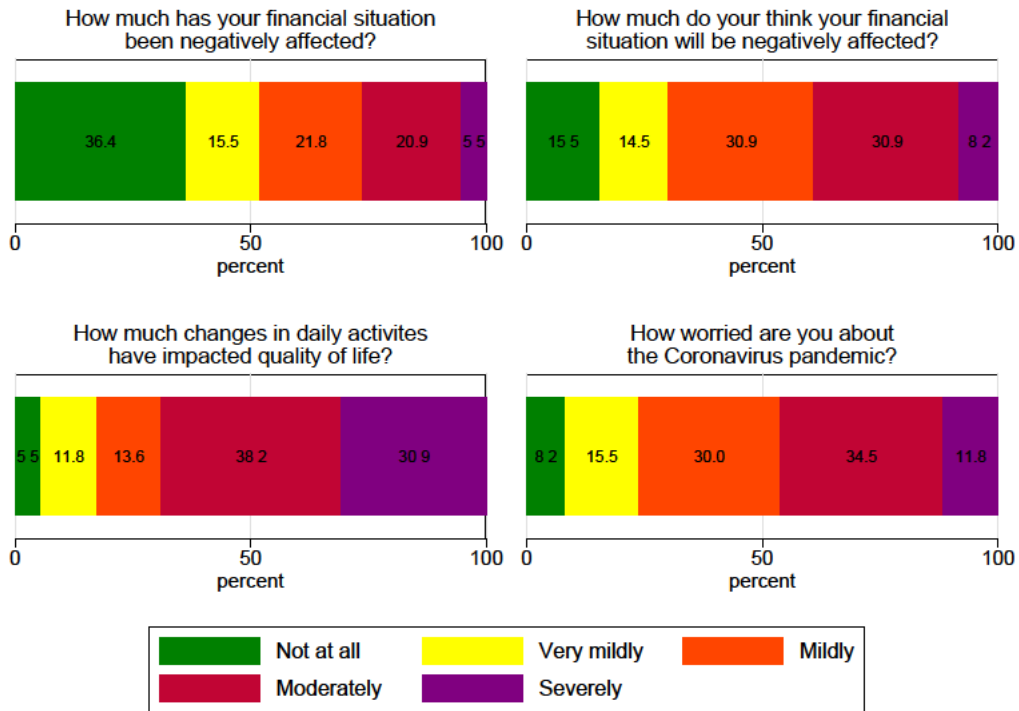
In this section, we study whether the individual changes in noncognitive skills between the Pre-COVID and COVID data are related to participants' experiences of the pandemic. For this purpose, we create an Impact Index by summing each participant's answers to the four questions

Differences of proportions by participant pool are tested using a t-test with unequal variances across groups.

¹³Among traders, 22% report a moderate or severe impact on current financial situation; among students, this fraction is 29%. The difference is not statistically significant (p-value=0.404). Among traders, 43% report a moderate or severe impact on future financial situation; among students, this fraction is 36%. The difference is not statistically significant (p-value=0.474).

¹⁴Among traders, 65% report a moderate or severe impact on quality of life; among students, this fraction is 72%. The difference is not statistically significant (p-value=0.449). Among traders, 39% report being moderately or severely worried about the pandemic; among students, this fraction is 52%. The difference is not statistically significant (p-value=0.154).

Figure 2: Impact of the COVID-19 Pandemic (II)



shown in Figure 2. We then divide participants into two groups depending on whether their Impact Index is below the median (“Low Impact” of the pandemic) or above the median (“High Impact” of the pandemic). In addition, we create a binary indicator taking value one if the participant answers affirmatively to at least one of the two questions about infections (“Have either you or a member of your household been infected by the Coronavirus?” and “Has any relative or close friend been infected by the Coronavirus?”) and zero otherwise; that is, we divide participants into two groups depending on whether they experienced an infection within their personal circle (“Infection”) or not (“No Infection”). We then compare average changes in noncognitive skills with respect to these two measures, Low versus High Impact, and Infection versus No Infection.

Figures 3 shows average changes in traders’ noncognitive skills by these two measures (along with the 95% confidence intervals). A clear relationship is observed between perceived impact of the pandemic and changes in traders’ Agreeableness and LoC (top figure). High-Impact traders show larger decreases in both skills. High-Impact traders significantly decrease Agreeableness by nearly 0.5 units ($p\text{-value}=0.002$), corresponding to a 16% drop relative to the Pre-COVID data; the decrease for Low-Impact traders is not statistically different from zero ($p\text{-value}=0.480$). A similar pattern is observed when comparing changes in Agreeableness across Infection and No-Infection traders (bottom figure). Infection traders significantly decrease their Agreeableness by 0.4 units ($p\text{-value}=0.015$), corresponding to a 12% drop relative to the Pre-COVID data; the decrease for No-Infection traders is much smaller (0.18 units) and not significantly different from zero ($p\text{-value}=0.155$).

High-Impact traders significantly decrease LoC by 0.29 ($p\text{-value}=0.006$), corresponding to a 7% drop relative to the Pre-COVID data; the average change for Low-Impact traders is

only -0.13 and not statistically different from zero (p -value=0.192). However, unlike with Agreeableness, we do not observe a relationship between changes in LoC between Infection and No-Infection traders. Finally, we do not find statistically significant changes in the other noncognitive skills for High- or Low-Impact traders or for Infection or No-Infection traders.

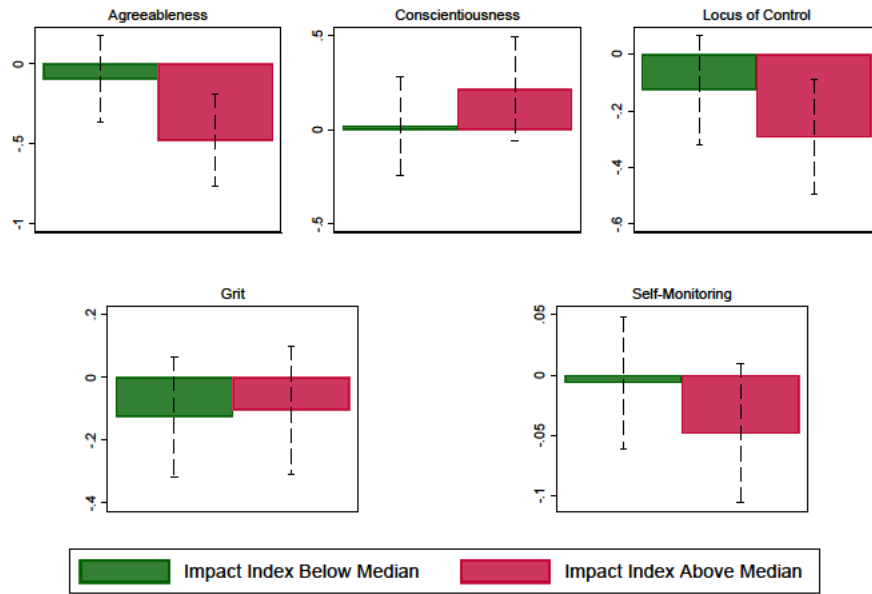
Figure 4 presents the results of the same analysis for student participants. Students increase Conscientiousness regardless of their experience of the pandemic: the change is, however, larger among those with a more negative experience. More specifically, High- and Low-Impact students increase Conscientiousness by 0.28 (p -value=0.020) and 0.19 units (p -value=0.092), corresponding to a 8% and 5% increase relative to the Pre-COVID data, respectively. Analogously, Infection and No-Infection students increase Conscientiousness by 0.35 (p -value=0.079) and 0.21 units (p -value=0.021), corresponding to a 10% and 6% increase relative to the Pre-COVID data, respectively. For Agreeableness, LoC, Grit, and Self-Monitoring, we do not observe statistically significant changes for High- or Low-Impact students or for Infection or No-Infection students.

Overall, our analysis shows that for those traits that were impacted by the pandemic, the change was often driven by those participants that were more affected by the pandemic itself. Our clearest result is that the decrease in Agreeableness and LoC detected within the sample of traders (Section 4.1) is mostly driven by those who perceive a more substantial effect of the pandemic on their daily lives. Our results provide support for the main results of our analysis, namely, that the changes we observe between the Pre-COVID and the COVID data can be attributed to the pandemic itself.

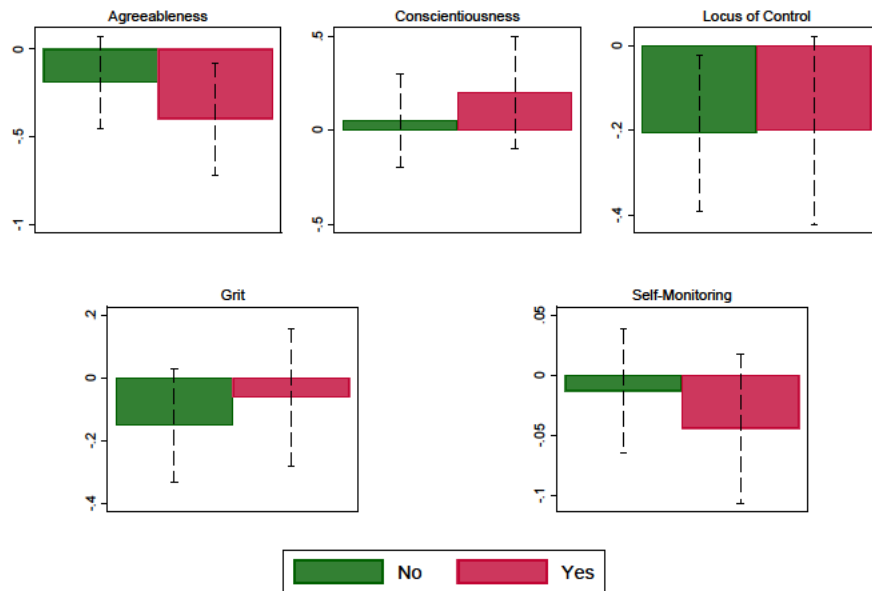
5 Conclusions

We have studied whether the COVID-19 pandemic has impacted noncognitive skills in a sample of professional traders and, for comparison purposes, in a sample of students. We have found a significant effect of the pandemic on professional traders' Agreeableness and Locus of Control (and, to a lower extent, Grit), and on students' Conscientiousness. Overall, our findings cast doubt on the stability of noncognitive skills, particularly among professional trader, which is often taken as given in the literature. Given the existing empirical relationship between noncognitive skills and individuals' financial decision making, the changes in noncognitive skills documented in this paper may have non-trivial consequences for economic outcomes, especially if they are permanent. Further data collected after the pandemic will help to shed light on the extent to which the changes in noncognitive skills observed at the onset of the pandemic are long-lasting; we leave the investigation of this issue for future research.

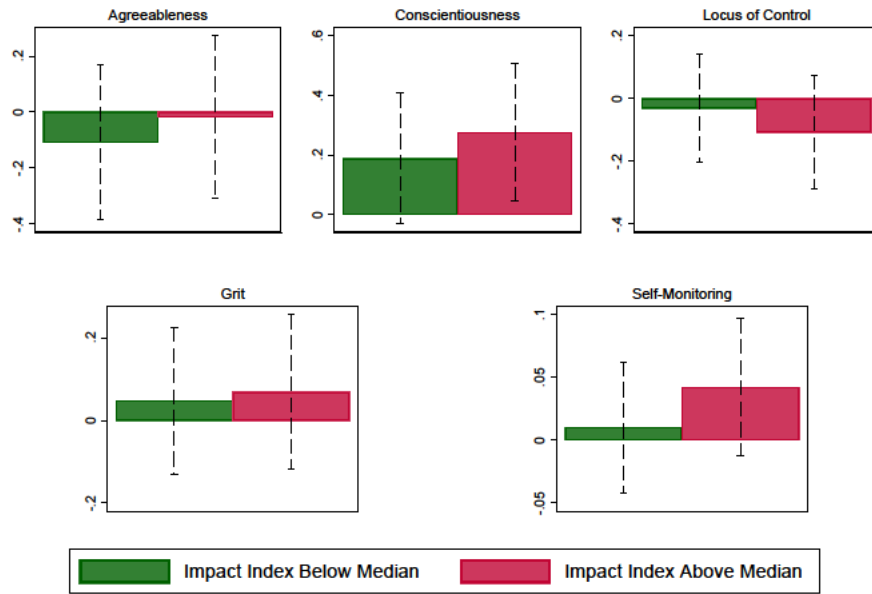
Figure 3: Changes in Outcomes by Pandemic's Experience — Traders
by Pandemic's Impact Index



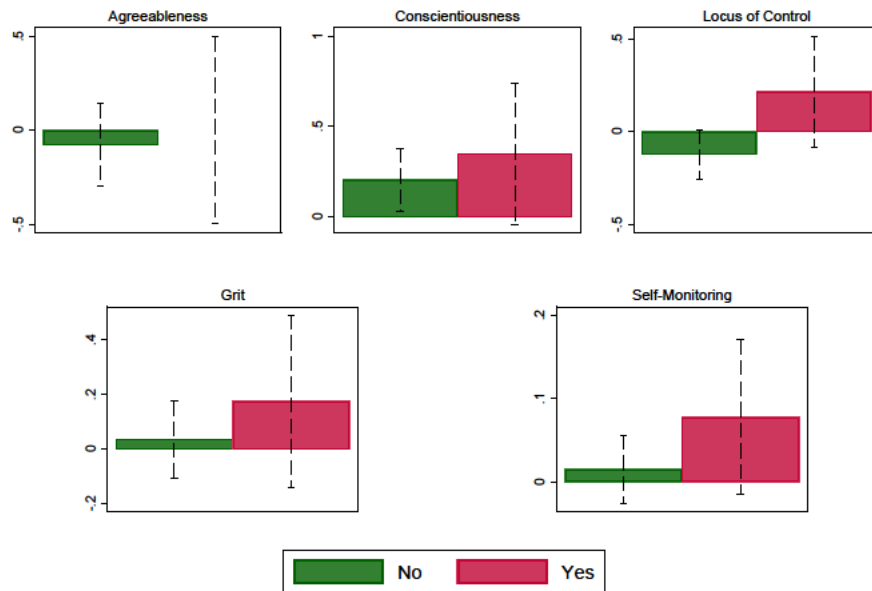
by Reported Infection



**Figure 4: Changes in Outcomes by Pandemic's Experience — Students
by Pandemic's Impact Index**



by Reported Infection



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Appendix

A Measures of personality traits not reported in the paper

We elicit Openness, Extroversion, and Neuroticism using the two-item measures from Rammstedt and John (2007).

A.1 Openness (to experience)

- *I have an active imagination.*
- *I have few artistic interests.*

The second measure is reverse coded and the unweighted average of both measures serves as our measure of Openness. Higher values of this measure reflect higher Openness.

A.2 Extroversion

- *I am outgoing, sociable.*
- *I am reserved.*

The second measure is reverse coded and the unweighted average of both measures serves as our measure of Extroversion. Higher values of this measure reflect higher Extroversion.

A.3 Neuroticism

- *I get nervous easily.*
- *I am relaxed, I handle stress well.*

The second measure is reverse coded and the unweighted average of both measures serves as our measure of Neuroticism. Higher values of this measure reflect higher Neuroticism.

A.4 Self-Monitoring Questions

How I am in general (continued)

As on the previous page, this page lists a number of statements that may or may not apply to you. If a statement is true or mostly true as applied to you, make a mark in the "True" column as your answer. If a statement is false or not usually true as applied to you, make a mark in the "False" column as your answer. Please record your answers in the spaces provided below.

	True	False
I find it hard to imitate the behaviour of other people.		
At parties and social gatherings, I do not attempt to do or say things that others will like.		
I can only argue for ideas which I already believe.		
I can make impromptu speeches even on topics about which I have almost no information.		
I guess I put on a show to impress or entertain others.		
I would probably make a good actor.		
In a group of people I am rarely the centre of attention.		
In different situations and with different people, I often act like very different persons.		
I am not particularly good at making other people like me.		
I'm not always the person I appear to be.		
I would not change my opinions (or the way I do things) in order to please someone or win their favour.		
I have considered being an entertainer.		
I have never been good at games like charades or improvisations.		
I have trouble changing my behaviour to suit different people and different situations.		
At a party I let others keep the jokes and stories going.		
I feel a bit awkward in public and do not show up quite as well as I should.		
I can look anyone in the eyes and tell a lie with a straight face.		
I may deceive people by being friendly when I really dislike them.		

B Noncognitive Skills by Age

Figure A.1: Agreeableness by Age in the pre-COVID Data

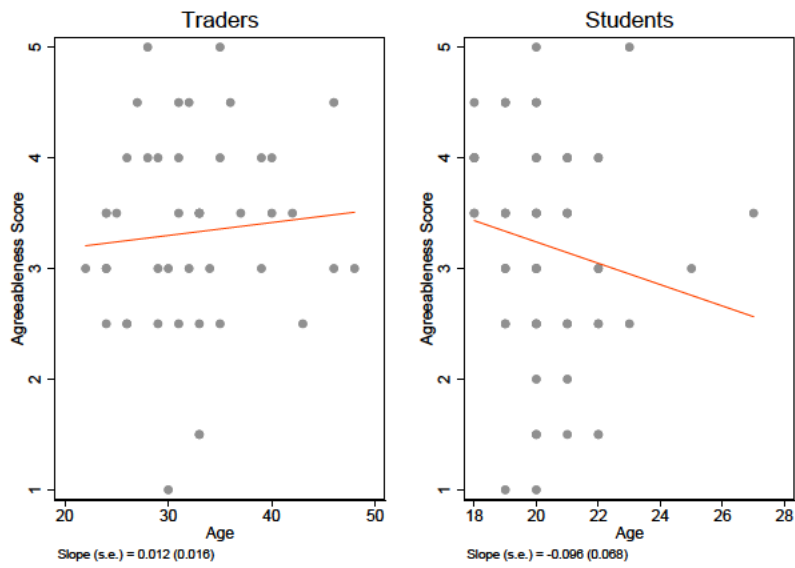
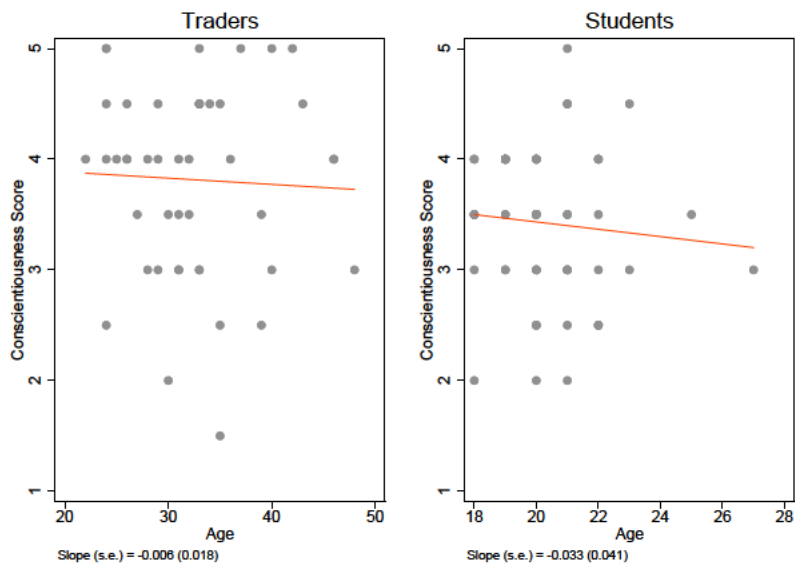


Figure A.2: Conscientiousness by Age in the pre-COVID Data



[h]

Figure A.3: Locus of Control by Age in the Pre-COVID Data

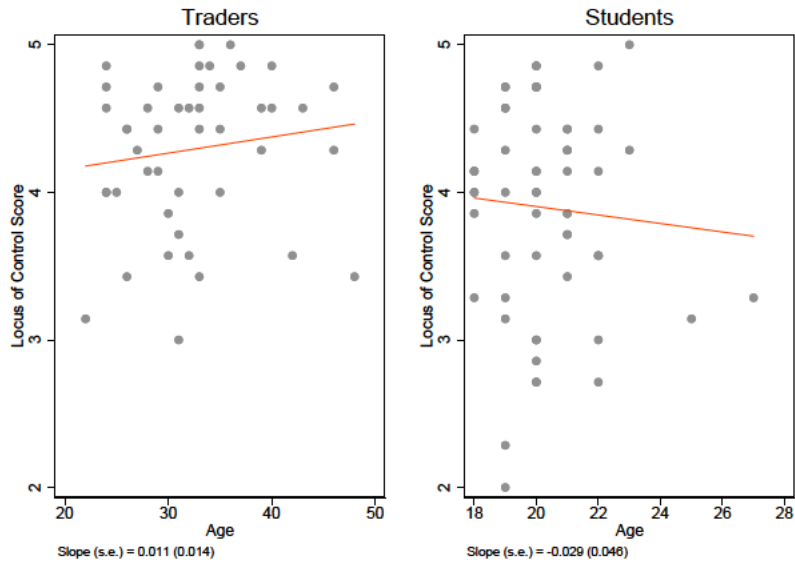


Figure A.4: Grit by Age in the Pre-COVID Data

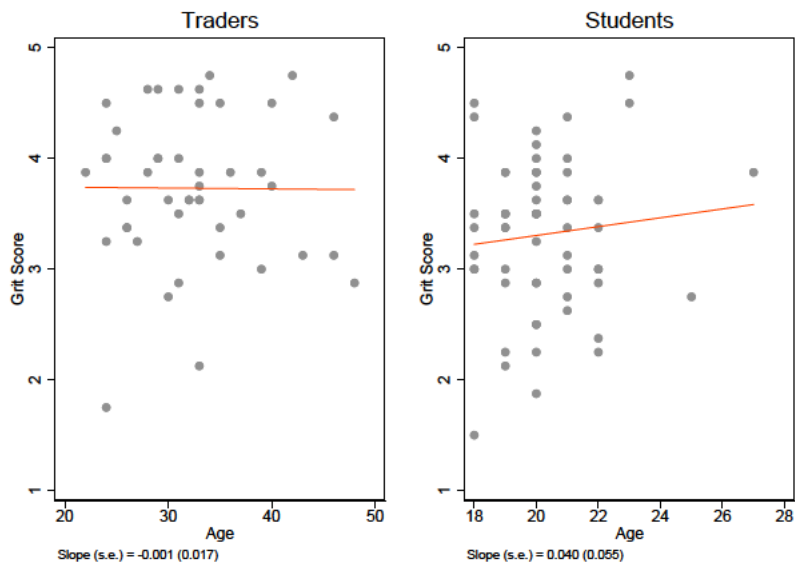
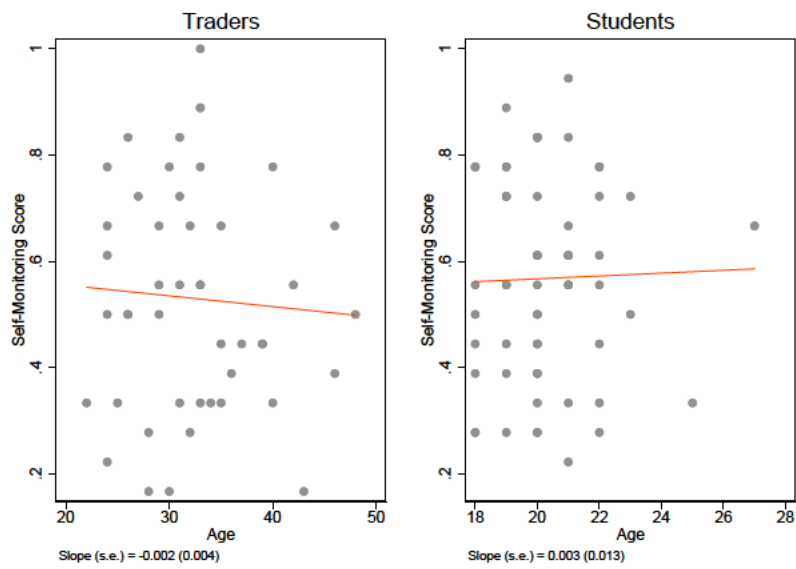


Figure A.5: Self-Monitoring by Age in the Pre-COVID Data



C Correlation across Outcomes in the Pre-COVID Period

Table A.1: Correlation across Outcomes in the Pre-COVID Data

Traders					
	Agreeab.	Conscient.	LoC	Grit	Self-Mon.
Agreeableness	1.00				
Conscientiousness	-0.04	1.00			
Locus of Control	-0.07	0.25*	1.00		
Grit	0.15	0.59***	0.10	1.00	
Self-Monitoring	-0.25*	-0.12	0.18	-0.16	1.00
Students					
	Agreeab.	Conscient.	LoC	Grit	Self-Mon.
Agreeableness	1.00				
Conscientiousness	0.01	1.00			
Locus of Control	-0.19	0.00	1.00		
Grit	0.21	0.46***	0.32***	1.00	
Self-Monitoring	-0.19	0.05	0.30***	0.08	1.00

We test the null hypothesis that the correlation is equal to zero with a t-test. *: p -value < 0.1, **: p -value < 0.05, ***: p -value < 0.01

D Changes in Noncognitive Skills among Students - Comparison with Additional Student Sample

Table A.2: Changes in Noncognitive Skills in Additional Student Sample

	Pre-COVID Data			COVID Data			$H_0 : E[\Delta Y] = 0$
	Mean	SD	Med	Mean	SD	Med	p-value
Agreeableness	3.29	0.83	3.50	3.11	0.82	3.00	0.211
Conscientiousness	3.25	0.62	3.25	3.28	0.66	3.25	0.794
Locus of Control	3.58	0.65	3.50	3.63	0.60	3.71	0.647
Grit	3.16	0.59	3.00	3.13	0.63	3.06	0.667
Self-monitoring	0.51	0.19	0.53	0.54	0.21	0.55	0.151

Note: $N = 34$. ΔY is the individual-level change in noncognitive skill Y between the COVID and the Pre-COVID data. *: p -value < 0.1, **: p -value < 0.05, ***: p -value < 0.01.

Table A.3: Changes in Noncognitive Skills in Student Samples Conditional on Gender

	Males	Females
Δ Agreeableness		
Students (main)	-0.031 (0.106)	-0.252 (0.181)
Students (additional)	-0.040 (0.151)	-0.261 (0.169)
Δ Conscientiousness		
Students (main)	0.297*** (0.081)	-0.062 (0.148)
Students (additional)	0.251* (0.133)	-0.108 (0.131)
Δ Locus of Control		
Students (main)	-0.074 (0.070)	-0.049 (0.108)
Students (additional)	0.031 (0.109)	0.055 (0.118)
Δ Grit		
Students (main)	0.088 (0.071)	-0.061 (0.085)
Students (additional)	0.059 (0.082)	-0.090 (0.118)
Δ Self-Monitoring		
Students (main)	0.026 (0.020)	0.016 (0.035)
Students (additional)	0.038 (0.035)	0.028 (0.022)

The data are obtained by pooling together the student sample described in the main text and the additional student sample, $N = 94$. The reported estimates are predicted changes for males and females in the two student samples from a regression of ΔY (Y is a noncognitive skill) on an indicator for main student sample and an indicator for male. Robust Delta Method standard errors are in parentheses. *: p -value < 0.1 , **: p -value < 0.05 , ***: p -value < 0.01 .

E Details about the experiment

E.1 Design of the experiment

We ran our experiment twice, the first time between February and May 2019 in the Experimental Laboratory for Finance and Economics (ELFE) in the Centre for Finance at the Department of Economics at University College London (UCL); the second time in April 2020, online. In 2019, we elicited participants' noncognitive skills via z-tree (Fischbacher, 2007). In April 2020, we invited the same participants to an online experiment run with o-Tree (see Chen et al., 2016, and Holzmeister and Pfurtscheller, 2016) during which we elicited noncognitive skills using the same battery of questions as in 2019. Furthermore, we asked participants to complete a questionnaire about the impact of COVID-19 on their lives. In both sets of data, we measure the following noncognitive skills: the Big-5 personality traits (Openness, Conscientiousness, Extroversion, Agreeableness, which includes a measure of Trust, and Neuroticism), Locus of Control, Grit

and Self-Monitoring.

Our sample includes only those who participated in both experiments.

E.2 Instructions

Welcome

Thank you for participating in our experiment. The experiment consists of a few different tasks and will take approximately 15 minutes to complete. You will receive £25 for completing the experiment and you have the opportunity to earn more money in the tasks.

Consent: As per our ELFE policy, on the next screen you will be asked to fill out a standard consent form after you read some general information about the experiment. If you have any questions about this information, please email the laboratory manager: Ryan.Kendall@ucl.ac.uk

Task 1 - Empty Box: After filling out the consent form you will move onto the experiment. You will first take part in the Empty Box task. This task consists of a few instruction screens explaining how the Empty Box task works and then you will make a choice in which you may earn more money.

Task 2 – Questions: After the Empty Box task, you will answer a series of questions that will be explained to you at that time.

Payment: Within 24 hours of your completing the experiment, we will send you your total payment for participating in our experiment. To do so, we will need ONE of the following pieces of information: Either (1) an email address linked to a Paypal account or (2) the account number and sort code of your UK bank.

Questions – How I am in general (1)

Listed below are a number of statements that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please choose a number next to each statement to indicate the extent to which you agree or disagree with that statement.

(Big-5 personality traits, Locus of Control and Grit questions asked below)

Questions – How I am in general (2)

As on the previous pages, this page lists a number of statements that may or may not apply to you.

If a statement is true or mostly true as applied to you, select the True button as your answer. If a statement is false or not usually true as applied to you, select the False button as your answer.

(Self-Monitoring measuring questions asked below)

Current situation and demographic questions

Please answer the following questions.

(Perceived impact of the pandemic questions asked below)

E.3 Selection and eligibility of subjects

The sample size for traders was chosen to have sufficient statistical power. The sample size for students was chosen to match that of traders (gender balance was also chosen to match that of traders).

E.4 Ethics oversight

This project was conducted under UCL's Module Ethical Approval #12439/001.