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Behavioral Response to Shock Exposure: COVID-19 Pandemic and Long-Term Savings

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Abstract

Providing future generations with sustainable and inclusive financial security during retirement is an important policy objective for developing countries. This study investigates the behavioral attitude of formal income earners during the COVID-19 pandemic in Uganda by examining individual perceptions in regards to access to long-term savings. The study explores the underlying behavioral mechanism by analyzing the effect of COVID-19 shock exposure on individual time preferences, as elicited from an economic experiment with randomly sampled subjects. Combining survey and experimental data, the results illustrate that shock exposure induces higher discount rates, and has an effect on subject's dynamic inconsistency. Those who report to having been affected by COVID-19 are more impatient, and are more likely to seek for early access to their long-term savings (e.g. NSSF or Occupational Pension funds). Further, we find a heterogeneous impact among the subjects. Male subjects, those who are indebted to servicing a loan, and those who did not receive a remittance within the last 3 months are found to be more impatient and are more likely to seek for early access to their long-term savings. On the contrary, we further find that females who prefer early access to their long-term savings are more present biased than their male counterparts. The results of this study suggest to us that formal income workers will consider saving for long-term through a forced saving mechanism. The findings from the study have important implications for public policy efforts to address long-term savings behavior.

Keywords

Economic Experiment, Discount Rate, Present Bias, Long-Term Savings, Uganda

1. Introduction

The Corona Virus or COVID-19 pandemic has undoubtedly given rise to a mas-

sive global health and economic shock, and has impacted the world in countless ways. The world, especially developing countries, will definitely endure continued sharper negative trade-offs and stiffer constraints. Already, we are witnessing massive disruptions of markets and institutions, with social protection avenues not spared. The pandemic, it is assumed, will in the mid-long term put an enormous strain on poorer countries' systems, especially given that most of the poor countries have limited capacity to cushion the pandemic, are highly indebted[1], face tight fiscal and monetary constraints, and have not adequately invested in robust social protection and anti-poverty programs. Indeed, COVID-19 poses considerable risks to already vulnerable populations living in countries with severe development deficits, limited government capacity and, importantly, poor healthcare infrastructure (World Food Program).

Whereas most governments have adopted the stance of lockdowns[2] that include staying at home, which has proven to be effective in upholding public social distancing, all in a bid to slow the spread of the virus on the one hand, these measures seem to be carrying an extraordinary high cost, most especially in poor countries, and pose new threats to hunger and increased poverty rates on the other hand (World Food Program). These measures have disrupted the production and supply of essential commodities to households, have led to food and transport price spikes, shrunk employment and ultimately led to a significant downfall of people's incomes.

Suffice to note that majority of the workforce in developing countries are engaged in the informal sector, thereby rendering them heavily dependent on daily casual labor incomes (hand to mouth consumption), have no or limited access to formal insurance buffers, have low food stocks, and possess limited or no savings. They are mainly focused on short-term expenditures and usually experience significant income volatility, making it difficult for them to save regularly[3], especially for the long term. Whereas research has shown that these groups do actually engage in some form of saving, their saving mechanisms are done in less conventional ways (Karlan et al., 2014)

Yet, long-term savings mobilization plays a substantial role in economic development of countries (Lucas, 1988; Solow, 1956), and is an important macroe-

[1]Provisional total public debt stock as at end May 2020 stood at Shs. 54,014.9 billion, an increase of about 14.7 percent relative to July 2019. The ratio of debt as a percentage of GDP stood at 39.1 percent in nominal value terms as at end May 2020 and 29.7 percent in present value terms, as at end March 2020. The loans acquired during the COVID-19 pandemic are likely to push the ratios up in part due to weaker fundamentals, including slower growth, exchange rate depreciation, weaker exports and a fragile domestic revenue base. External debt continues to be the dominant component of public debt, accounting for about 65.1 percent, while domestic debt accounts for 34.9 percent of total debt as at May 2020 (Bank of Uganda).

[2]To mitigate the spread, Uganda for example closed schools, shopping malls & arcades, worship places, banned public gatherings, public transportation was limited, borders were closed apart from movement of cargo trucks, and there was a ban on international travel. See **Figure 3** for a trajectory of COVID-19 cases in Uganda (Bank of Uganda Website).

[3]According to Karlan et al. (2014), barriers to saving exist particularly for the world's poor, e.g. Market frictions, including transaction costs, lack of trust, and regulatory barriers.

conomic element that directly impacts capital accumulation, productivity and long-term economic growth. According to Karlan et al., (2014), savings mobilization is critical for individual and societal welfare. For example, at the individual level, savings help households smooth consumption and finance productive investments in human and business capital, while at the macroeconomic level, savings rates are strongly predictive of future economic growth. Ownership of savings is also essential in creating a buffer for financial shocks (Gjertson, 2016), is critical in facilitating individuals to adequately prepare for retirement[4] (Noone, Stephens, & Alpass, 2009), and is important in allowing individuals to pursue their financial goals (Kendall, 2010; Shim, Serido, & Tang, 2012).

However, Hastings & Mitchell (2018) contend that there are two competing explanations why individuals have trouble with financial decisions that include saving for the long term. One is that people are financially illiterate since they lack understanding of simple economic concepts and cannot carry out computations such as computing compound interest, which could cause them to make suboptimal financial decisions. The second is that impatience or present-bias might explain suboptimal financial decisions, which insinuates that some people persistently choose immediate gratification instead of taking advantage of larger long-term payoffs (Ashraf et al., 2006; Rabin & O'Donahue, 1999).

This study therefore focuses on exploring the underlying behavioral mechanism of individuals affected by COVID-19 on individual time preferences i.e. discount rates and present bias. By undertaking an economic experiment with randomly sampled formal income earners who were exposed to COVID-19, we examine whether shock exposure to COVID-19 affects time preferences. The study hypotheses that exposure to COVID-19 induces higher discount rates and present biasness. Our underlying identification relies on the assumption that the shock exposure is exogenous in nature.

Our results indicate that exposure to COVID-19 induces higher discount rates, and has a positive impact on present biasness. Those who report to have been affected by COVID-19 are more impatient, and are more likely to seek for early access to their long-term savings (e.g. NSSF or Occupational Pension funds). Further, we find a heterogeneous impact among the subjects. Male subjects, those who are indebted servicing a loan, and those who did not receive a remittance within the last 3 months are found to be more impatient and are more likely to seek for early access to their long-term savings. On the contrary, we further find that females who prefer early access to their long-term savings are more present biased than their male counterparts.

This enduring effect of higher discount rates and present biasness can be partially because exposure to COVID-19 indeed affected individual preferences, which makes it difficult for those affected to invest in long-term activities, and

[4]People suffer from financial illiteracy (Lusardi and Mitchell 2007). This argument contends that many people lack the knowledge of key economic concepts and skills needed to make financial computations, which may cause them to make suboptimal financial decisions.

savings for the future. If so, efforts to promote long-term savings need to take individual preferences into consideration in order not to hinder progress of stimulating long-term saving behaviors.

To the best of our knowledge, this is the first study that examines the effect of a shock exposure on time preferences specifically for formal income workers in Uganda during a global pandemic. Ascertaining the time preferences of individuals who have been exposed to COVID-19 is important because this aids policy makers towards formulation of appropriate policies from an informed point of view in spurring saving efforts for the long term. In addition, our study combines survey data and an economic experiment for the analyses.

The rest of the paper is organized as follows. Section 2 provides a brief background to the COVID-19 pandemic. Section 3 discusses the data, experimental design, and experimental results. Section 4 discusses descriptive statistics. Section 5 presents the identification strategy and estimation model. Section 6 presents the estimation results while Section 7 concludes with policy recommendations.

2. Background to COVID-19 and the Case of Uganda

On December 31, 2019, the People's Republic of China informed the World Health Organisation (WHO) of an outbreak of a respiratory causing illness, which was later named the "severe acute respiratory syndrome coronavirus 2" (SARS-CoV-2) that causes the Corona Virus Disease (COVID-19). On January 30, 2020, World Health Organization declared the outbreak as a Public Health Event of International concern (PHEIC). This became the pandemic that has been termed as "the worst health crisis of our times" with over 11 million infections and 500,000 deaths, in 216 countries by the end of June 2020. It currently has no specific vaccine or treatment.

The first COVID-19 case in Africa was reported in Egypt on February 14, 2018 with Nigeria recording Sub Saharan Africa's first incident ten days later and East Africa discovering her first patient in Kenya on March 13, 2010, one day after WHO had declared COVID-19 a pandemic. Uganda's first case was reported on March 21, 2020. In an effort to control the spread of the pandemic, Uganda like several nations worldwide established several similar measures. The measures in Uganda seem to be successful due to the fact that there is no single fatality yet despite over 900 confirmed cases by July 01, 2020 and to the government's credit, there have been over 800 recoveries. Efforts to curb the spread of the COVID-19 pandemic health crisis elicited a harsh economic recession for the global economy and Uganda was not spared. In April 2020, the International Monetary Fund (IMF) World Economic Outlook (WEO) projected that the global economy will contract by 3 percent in 2020. In particular, Sub-Saharan Africa (SSA), will contract by 1.6 percent due to the fragility of commodity exports prompted by brutally low external demand, collapsed commodity prices and high capital outflows leading to currency depreciations.

Uganda in particular has been impacted in various ways. Economic activity

contracted and GDP growth was projected to slow down drastically in the second half of Financial Year (FY) 2019/20, at 3 - 4 percent from 6.5 percent. This was due to a combination of global supply chain disruptions, a worsening external position accruing from capital outflows, adverse effects on the flow of international trade, tourism, workers' remittances, foreign direct investment and loan disbursement. Other effects arose from travel restrictions, measures to limit contact between persons (lockdowns, school closures, shutting down non-essential businesses and curfew), and the sudden decline in demand. As a result, consumer-facing sectors were critically affected by social distancing measures and heightened uncertainty, while the manufacturing sector declined on account of disruptions to the inflow of raw materials. The trade sector was weighed down by the decline in external demand and supply chain disruptions, while service sectors such as finance, insurance, and information and communications were affected by the general stall in business activity and investment.

With several citizens among the country's workforce in a similar condition, a section of the public through their political representatives[5] requested the National Social Security Fund (NSSF) to pay members at least 20 per cent of their savings to be able to fend off the anticipated negative effects of COVID-19. The NSSF is governed by a law, which does not allow for mid-term access. The public and law makers agitated for a change to the law to include midterm access as well as provisions that allow the Fund to create products such as employment, education and housing benefits among others. In response, the Fund's management team responded by discouraging the proposal, claiming that such a payout would benefit few, and not address the wider need for relief yet distress the sustainability of the fund, and cause irreparable damage on the wider economy and the financial system. According to the management, implementing the request required about Shs 3400 billion. Some commentators rebuffed the Fund's stance, arguing that some of NSSF's members had lost jobs while others had suffered natural calamities such as flooding, and therefore such members expected goodwill from their fund during such abnormal times. Others labelled NSSF's response as simply a move to self-preserve through "fearmongering or scaremongering" to deliberately spread frightening and exaggerated information meant to arouse public fear. According to critics, the Fund gave a one-sided narrative, yet it was better to seek solutions that work for members seeing that the fate of the Fund, its members and employers are intertwined.

3. Data and Experiment

3.1. Data

The study adopted an open unrestricted online web survey entirely based on self-responding. Anybody who received the link

[5]See for example (Parliament of Uganda); https://www.parliament.go.ug/news/4586/covid19-mps-call-economic-stimulus.

https://forms.gle/2HW21RQFisr3BR6n6 on their mobile phones or personal computers could fill out the online questionnaire. The link was circulated via different online platforms including Whatsapp, Facebook, Email and LinkedIn for a period of 10 days, beginning from May 19 - 28, 2020. The target group of respondents was formal income earners who have a long-term saving, for example, savings at the National Social Security Fund, or those who save with occupational saving schemes at their organizations. All those who received the link were also requested to widely circulate the link to their other networks like Whatsapp groups, Facebook friends, Organizational emails etc. The online questionnaire was designed in such a way that those who indicated at the beginning of answering the questionnaire that they were not part of a long-term saving scheme, they would not proceed to fill in the rest of the questionnaire. Given that our sample was restricted to only those that have a long-term saving, our sample should arguably be representative of the target group of formal income earners who are members of a long-term saving scheme.

As at the closing date, 611 respondents had successfully submitted their questionnaires from 15 different organizations/sectors including[6] Accounting/Auditing (22), Banking (155), Construction (15), Education (50), Export/Import (4), Financial Management (22), Government Parastatal (75), Hotel (20), Insurance (7), Manufacturing (17), Media (10), Non-Governmental Organization (69), Telecom (24), Transport (12) and Others (109).

The last part of the questionnaire involved an economic experiment that we utilize to measure time preferences, by computing each respondent's discount rate and present biasness.

3.2. Measuring of Time Preferences

3.2.1. Discount Rate

The time preference experiments are elicited to estimate the subjects' discount rate and present bias, in addition to comparing the degree of patience of the subjects. To estimate the subjects' discount rate (r), experiments 1 (**Figure 1**) and 2 (**Figure 2**) are utilized individually to obtain the discount rate intervals per experiment. We utilize the value function $v(M_0)=\frac{1}{(1+r)^t}\times v(M_t)$, where M_0 denotes the present value for the subject who faces payoff M_t, which is offered at time t with discount rate r. It is assumed that $v(M_t)=M_t$. In order to estimate each subject's discount rate, we equate the switching point between two choices and take the midpoint of the interval. For example, to calculate a subject's discount rate (r) taking into consideration experiment 1 (**Figure 1**), suppose a subject switches from column A to column B in row 1 - 4; the time preference can then be computed as $\frac{1}{(1+r)^4}\times 6000000 \le \frac{1}{(1+r)^6}\times 10000000$.

[6]In parenthesis are the respondents from each organization/sector. Also see **Table 4**.

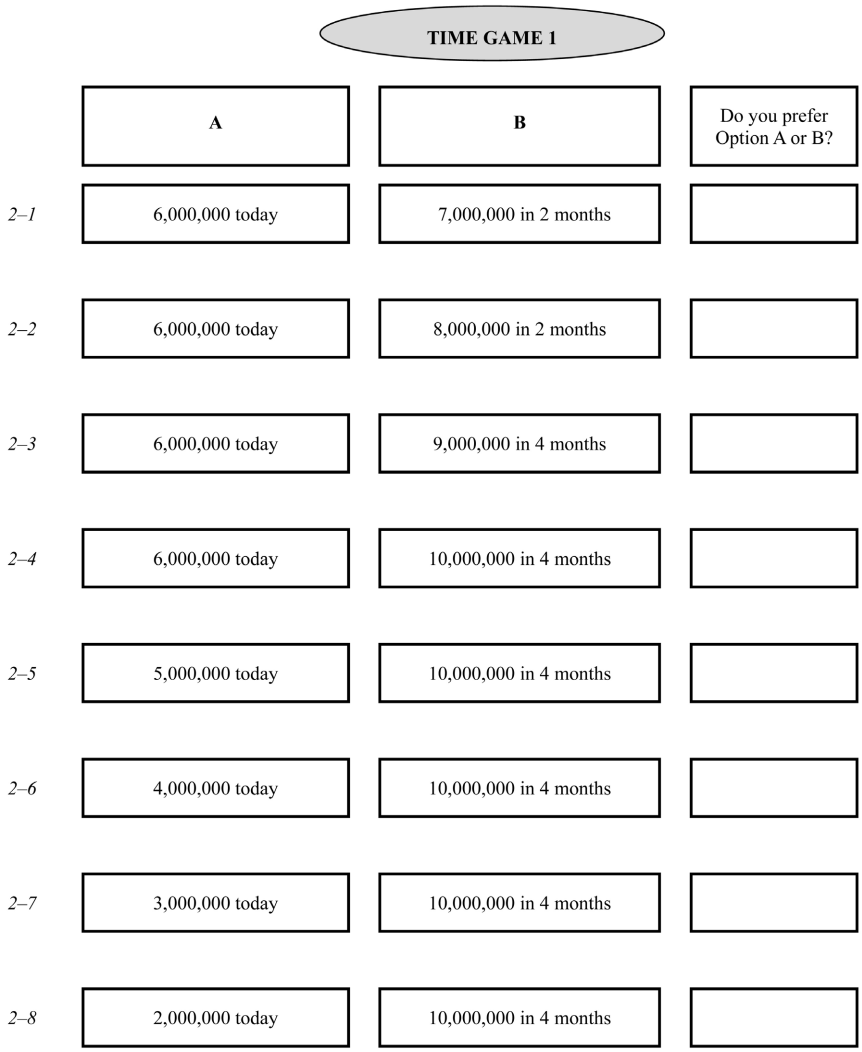

Figure 1. Time preference experiment 1 answer sheet.

Solving for r, the discount rate becomes $r \leq 0.1215$. Experiment 1 (Figure 1) involved no front-end delay while experiment 2 (Figure 2) involved a front-end delay. For time preference experiment 1 (Figure 1), subjects were asked to choose between option A with payoff amounts to be earned that same day (immediate payment), and option B with payoff amounts to be earned in 4 months. For time preference experiment 2 (Figure 2), subjects were asked to choose between option A with payoff amounts to be earned in 4 months, and option B with payoff amounts to be earned in 8 months.

3.2.2. Present Bias

Present bias is elicited from experiment 1 (Figure 1) and 2 (Figure 2). The pair-wise choices in both experiments are identical, the only difference being the timing of payment. The timing of experiment 1 (Figure 1) is today or 4 months while that for experiment 2 (Figure 2) is 4 months or 8 months. Since experiments 1 and 2 have same structure in terms of time discount, the switching point

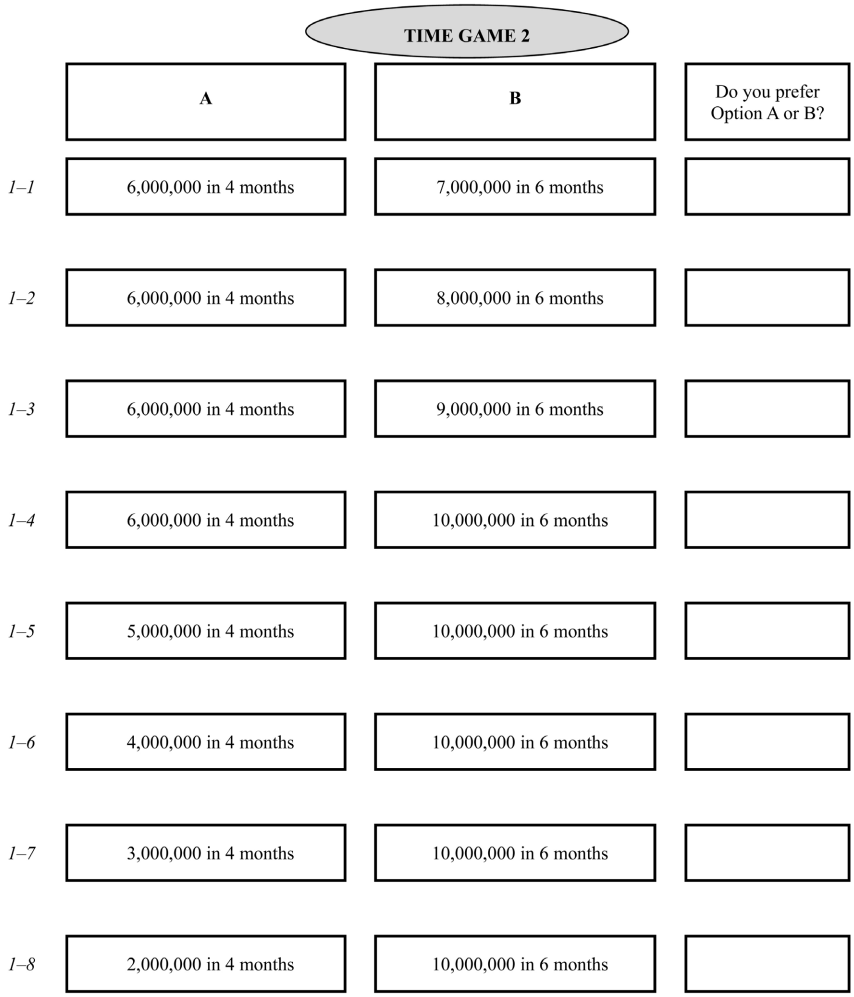

Figure 2. Time preference experiment 2 answer sheet.

should be the same in these two experiments if there is no present bias (Tanaka & Munro, 2014). The different timeframes allow for the identification of dynamic inconsistency, because subjects deemed dynamically inconsistent demonstrate bias toward future rewards. Following Meier and Sprenger (2010), we compute a present bias dummy and present the bias intensity of each subject. A subject is defined as having present bias when he/she is less patient when a smaller, earlier reward is preferred in the present, where time is today ($t = 0$). Therefore, we classify a subject as having present bias if the discount rate from experiment 1 (**Figure 1** where $t = 0$ or $t = 4$) is less than the discount rate from experiment 2 (**Figure 2** where $t = 4$ or $t = 8$). As a measure of present bias intensity of each subject, we take the ratio of the discount rate from experiment 2 (**Figure 2**) over the discount rate from experiment 1 (**Figure 1**).

Table A1 and **Table A2** show the payoff matrix for time preference experiments 1 and 2, respectively. For time preference experiment 1 and 2, subjects who chose all A option are considered very impatient and therefore, are assigned $r = 0.4233$, while subjects who chose all B option are considered very patient and

therefore, are assigned $r = 0.0197$. It is noteworthy that all subjects who had multiple switching[7] were regarded as having irrational answers, and therefore, were dropped from the analysis.

4. Descriptive Statistics

Table 1 presents summary statistics for the individuals (experiment subjects) who responded to the online survey. The mean age of the subjects is 38.05 years, 72% are married while 60% of the respondents are male. Average household size is 5 members, with each household composed of an average of 3 children (below 18 years), while 76% of the respondents are household heads.

The average gross salary is about Ugx5, 090,344/- and only 38% of the respondents have another source of income apart from their monthly salary. 72% are servicing a loan with a financial institution. 13% of the respondents received remittances within the last 3 months, with majority of the remittances used for

Table 1. Descriptive statistics.

	Mean
Discount Rate 1	0.2033
Discount Rate 2	0.2031
Present Bias	0.231
Characteristics	
Age	38.05
Marital Status (married = 1)	0.72
Gender (male = 1)	0.60
Household Size	4.8
Household Head (=1)	0.76
Household below 18 Years	2.5
Gross Salary	5,090,344
Net Salary	3,108, 429
Other Income Source (=1)	0.38
Servicing Loan (=1)	0.72
Received Remittances (last 3 months)	0.13
Affected by COVID-19	0.91
Recommends Early Access to Savings (=1)	0.788
Preferred Age for Partial Access	45.4
Preferred Age for No Partial Access	55.4

[7]13 subjects had multiple switching in game 1, while 13 had multiple switching in game 2.

consumption[8]. 91% claim that they were financially and economically affected by the COVID-19 pandemic.

A total of 78.8% of the respondents recommend the law to be amended to enable them have early access to their long-term savings, and of these, 91.3% prefer to access part of their savings at age 45.4 years. For those who don't recommend early access to their long-term savings, 91.48% prefer accessing their savings at age 55 years, while 5.52% prefer accessing their savings at age 60 years.

Table 2 presents summary statistics categorized by two groups; those who indicated that they were severely affected by COVID-19 pandemic, and those who were not affected by the pandemic. We use the ttest inferential statistic to determine if there is any significant statistical difference between the means of two groups. Without controlling for any covariates, we do not find any significant statistical difference between those who were affected by COVID-19 pandemic and those not affected in terms of age, marital status, gender, being a household head, and those who received remittances in last 3 months.

However, we find that households with more household members are more likely to have been affected by the pandemic. Similarly, households with more children were more affected by the pandemic. Individuals with less income and those without another source of income apart from their salaries are more likely to be more affected by the pandemic. Individuals that are servicing a loan from a financial institution are more affected by the pandemic, while those that indicated that they prefer early access to their long-term savings are found to be more affected by the pandemic.

Table 3 presents summary statistics categorized by two groups; those who indicated that they prefer early access to their long-term savings, and those who do not prefer early access to their long-term savings. We do not find any significant statistical difference for age, gender and those who received remittances in last 3 months. We however find that those who prefer early access to their long-term savings have higher discount rates. Similarly, those who are family heads and those married prefer early access to their long-term savings. Households with larger families and those with more children prefer early access to their long-term savings. Likewise, those with less salaries, those with no other income apart from salary and individuals that are servicing a loan from a financial institution are all found to prefer early access to their long-term savings.

Table 4 shows the number of respondents per organization/sector, and the average discount rates for each organization/sector for experiment 1 and 2. As expected, we find that the export/import sector, hotel sector and transport sector indicate the highest average discount rates (above 30%) for both experiments 1 and 2. This may be on the premise that these sectors were amongst those most hit by the COVID-19 pandemic in Uganda.

[8]80 of the respondents received remittances which they used for various expenditures. General consumption (39); Education (6); Rent (6); Construction (5); Health (3) and Other (21).

Table 2. Descriptive statistics.

	Combined Mean	Affected by COVID-19	Not Affected by COVID-19	*t*-stats
Discount Rate (Time Game 1)	0.203	0.207	0.164	−1.794*
	(0.165)	(0.164)	(0.164)	
Discount Rate (Time Game 2)	0.203	0.206	0.174	−1.351
	(0.160)	(0.160)	(0.159)	
Present Bias	0.231	0.229	0.250	0.349
	(0.422)	(0.420)	(0.437)	
Characteristics				
Age	38.051	38.145	37.038	−1.116
	(6.840)	(6.889)	(6.265)	
Marital Status (married = 1)	0.717	0.717	0.712	−0.089
	(0.451)	(0.451)	(0.457	
Gender (male = 1)	0.601	0.599	0.615	0.226
	(0.490)	(0.490)	(0.491)	
Household Size	4.833	4.878	4.346	−2.064**
	(1.783)	(1.769)	(1.877)	
Household head (=1)	0.764	0.773	0.673	−1.622
	(0.425)	(0.419)	(0.474)	
Household below 18 Years	2.542	2.599	1.923	−2.697***
	(1.738)	(1.729)	(1.736)	
Gross Salary	5,090,344	4,988,104	6,189,423	2.462***
	(3,376,185)	(3,376,185)	(3,247,448)	
Net Salary	3,108,429	3,002,326	4,249,038	3.271***
	(2,577,890)	(2,577,890)	(3,134,743)	
Other Income Source (=1)	0.381	0.370	0.500	1.844*
	(0.486)	(0.483)	(0.505)	
Servicing Loan (=1)	0.722	0.741	0.519	−3.435***
	(0.448)	(0.439)	(0.505)	
Received Remittances (last 3 months)	0.131	0.134	0.096	−0.776
	(0.338)	(0.341)	(0.298)	
Recommends Early Access to Savings (=1)	0.789	0.818	0.481	−5.839***
	(0.408)	(0.387)	(0.505)	
Preferred Age for Partial Access	45.446	45,424	45.840	1.371
	(0.408)	(1.414)	(3.375)	
Preferred Age for No Partial Access	55.426	55.392	55.556	0.537
	(1.402)	(1.351)	(1.601)	

Table 3. Descriptive statistics.

	Combined Mean	Early Access to Savings	No early Access to Savings	*t*-stats
Discount Rate (Time Game 1)	0.203	0.219	0.146	−4.459***
	(0.165)	(0.164)	(0.157)	
Discount Rate (Time Game 2)	0.203	0.213	0.166	−2.939***
	(0.160)	(0.158)	(0.164)	
Present Bias	0.231	0.227	0.244	0.396
	(0.422)	(0.419)	(0.431)	
Characteristics				
Age	38.050	38.025	38.147	0.180
	(6.840)	(6.583)	(7.753)	
Marital Status (married = 1)	0.717	0.737	0.643	−2.089
	(0.451)	(0.441)	(0.481)	
Gender (male = 1)	0.601	0.598	0.612	0.306
	(0.490)	(0.491)	(0.489)	
Household Size	4.833	4.911	4.543	−2.089
	(1.783)	(1.739)	(1.916)	
Household head (=1)	0.764	0.782	0.698	−2.011
	(0.425)	(0.413)	(0.461)	
Household below 18 Years	2.542	2.693	1.977	−4.213
	(1.739)	(1.722)	(1.688)	
Gross Salary	5,090,344	4,873,963	5,898,837	3.080
	(3,379,527)	(3,320,669)	(3,486,730)	
Net Salary	3,108,429	2,925,934	3,790,310	3.318
	(2,649,868)	(2,525,521)	(2,983,451)	
Other Income Source (=1)	0.381	0.351	0.496	3.039
	(0.486)	(0.478)	(0.502)	
Servicing Loan (=1)	0.722	0.757	0.589	−3.823
	(0.448)	(0.429)	(0.494)	
Received Remittances (last 3 months)	0.131	0.127	0.147	0.619
	(0.338)	(0.333)	(0.356)	

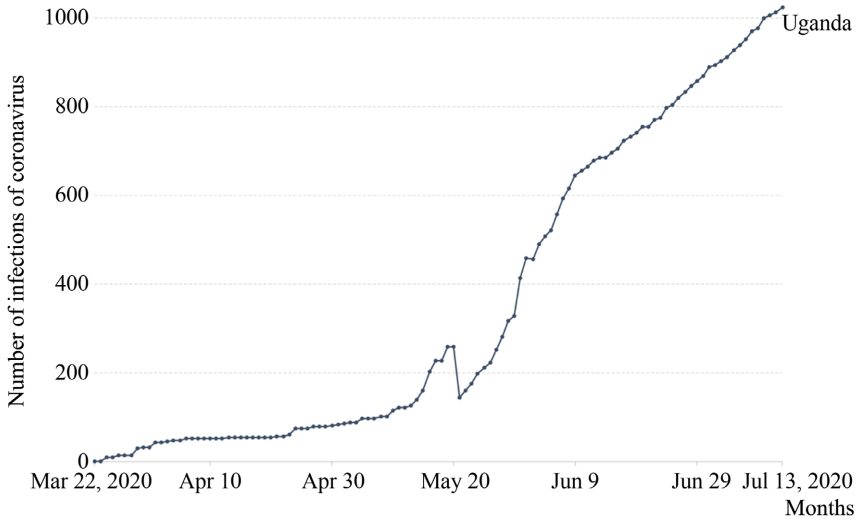

Figure 3. Trajectory of Coronavirus cases in Uganda. Source: OurworldInData.org/Coronavirus.

Table 4. Descriptive statistic—organizational averages.

No	Organization	No. of Respondents	Discount 1	Discount 2
1.	Accounting/Auditing	22	19.05	22.38
2.	Banking	155	17.69	16.99
3.	Construction	15	23.07	22.36
4.	Education	50	21.74	21.11
5.	Export/Import	4	33.64	35.66
6.	Financial Management	22	17.39	15.36
7.	Government Parastatal	75	21.17	17.73
8.	Hotel	20	33.31	33.39
9.	Insurance	7	15.05	20.72
10.	Manufacturing	17	13.20	16.56
11.	Media	10	16.89	16.01
12.	NGO	69	24.23	25.41
13.	Other	109	19.25	20.44
14.	Telecom	24	16.93	19.37
15.	Transport	12	33.91	32.01

5. Identification Strategy and Estimation Model

To identify the impact of the shock exposure (COVID-19) on individual time preferences, we construct a binary variable that takes the value 1 if a respondent indicated that they were affected by the COVID-19 pandemic, and 0 if not affected. We estimate the following model by ordinary least squares (OLS) estima-

tion.

$$y_{id} = \beta_0 + \beta_1 D_{id} + \beta_2 X_{id} + \mu_d + e_{id} \quad (1)$$

where y_{id} denotes individual time preference parameters of individual i from organization d. D_{id} is a dummy variable taking the value 1 if individual i in organization d reports that they were affected by the COVID-19 pandemic, and 0 not affected. X is a vector of a set of controls, including individual and household characteristics as shown in Table 1. μ_d is organizational fixed effects. e_{id} denotes the error term. After controlling for the covariates, the effect of COVID-19 on time preferences is measured by β_1. We argue that the exposure to COVID-19 is exogenous given the nature and spread of its occurrence worldwide. For our regression specification, robust standard errors are clustered at the organization level to account for sampling scheme and possible correlation among respondents in the same organization.

We acknowledge some constraints with the study. Since we did not collect pre COVID-19 individual preference data, it may be difficult to ascertain past preference behaviors of the respondents. In addition, if some subjects in some organizations were never targeted, most likely because they never got the opportunity to receive the link to the questionnaire and therefore did respond to our questionnaire, yet they have different time preferences from those who responded, the estimated impact can be biased. The direction of the bias, however, is not clear. For example, if the non-respondents have a high/low discount rate or are more present biased, the impact on time preferences could be over/under-estimated. Whereas we include various covariates as controls and organizational fixed effects, the estimated effect needs to be interpreted with some level of caution.

6. Estimation Results

Table 5 presents regression results for discount rates where the shock exposure variable is a binary that takes a value 1 if respondent indicated that they were affected by COVID-19, and 0 otherwise. The dependent variable is the discount parameter. For all the estimations, robust standard errors are clustered at the organizational level and organizational fixed effects are included to account for organization specific time-invariant unobserved heterogeneity. Column 1 and 3 do not include fixed effects, while column 2 and 4 include fixed effects. Consistently, the estimated results show that exposure to COVID-19 induces higher discount rates, suggesting that those who were severely affected by COVID-19 are more impatient. The results are robust when with and without fixed effects, even when we limit the covariates. We find that age and those with another source of income apart from salary are negatively associated with discount rate.

In Table 6, we estimate the same specifications as in Table 5, this time restricting columns 1 and 2 to subjects that prefer early access to their long-term savings, while columns 3 and 4 are restricted to those who do not prefer early access to their long-term savings. The estimated results in columns 1 and 2 show that exposure to COVID-19 induces impatience for those who prefer early access

Table 5. COVID-19 exposure on discount rate.

	Discount rate			
	(1)	(2)	(3)	(4)
Affected by COVID-19 (=1)	0.045*	0.044*	0.042*	0.042*
	(0.024)	(0.024)	(0.023)	(0.023)
Age			−0.003***	−0.003***
			(0.001)	(0.001)
Gender (1 = Male)			−0.004	−0.004
			(0.019)	(0.019)
Married			0.002	−0.008
			(0.018)	(0.018)
Head			0.014	0.012
			(0.022)	(0.022)
Household Size			0.002	0.003
			(0.004)	(0.004)
Servicing Loan (=1)			−0.008	−0.007
			(0.016)	(0.017)
Other Income Apart from Salary			−0.034**	−0.029*
			(0.015)	(0.015)
Received Remittance Last 3months			−0.008	−0.010
			(0.021)	(0.020)
Organizational Fixed Effects	No	Yes	No	Yes
Observations	598	598	598	598
R-squared	0.005	0.066	0.040	0.092

Notes: Organizational fixed effects included. Organization robust clustered standard errors are in parenthesis. Significance levels are ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$. Columns 2 and 4 include organizational fixed effects.

Table 6. COVID-19 exposure on discount rate.

	Discount rate			
	(1)	(2)	(3)	(4)
Affected by COVID-19 (=1)	0.052*	0.052**	−0.014	−0.012
	(0.031)	(0.027)	(0.035)	(0.027)
Age		−0.003**		−0.002
		(0.001)		(0.001)

Continued

Gender (1 = Male)		0.007		−0.013
		(0.017)		(0.067)
Married		−0.020		0.001
		(0.015)		(0.028)
Head		0.000		0.031
		(0.016)		(0.063)
Household Size		0.004		−0.003
		(0.004)		(0.007)
Servicing Loan (=1)		−0.010		−0.002
		(0.021)		(0.033)
Other Income apart from Salary		−0.014		−0.045
		(0.011)		(0.036)
Received Remittance last 3months		−0.017		0.014
		(0.026)		(0.023)
Organizational Fixed Effects	Yes	Yes	Yes	Yes
Observations	472	472	126	126
R-squared	0.065	0.085	0.204	0.236

Notes: Organizational fixed effects included. Organization robust clustered standard errors are in parenthesis. Significance levels are ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$. Columns 1 and 2 are restricted to subjects that preferred early access to their long term savings. Columns 3 and 4 are restricted to subjects that did not prefer early access to their long term savings.

to their long-term savings. We find no effect when we restrict our sample to those who do not prefer early access to their long-term savings.

In Table 7, Column 1 is restricted to male subjects; Column 2 is restricted to female subjects; Column 3 is restricted to subjects who are servicing a bank loan; Column 4 is restricted to subjects who are not servicing a bank loan; Column 5 is restricted to subjects who received remittances within the last 3 months; Column 6 is restricted to subjects who did not receive any remittances in the last 3 months. We find significant results for columns 1, 3 and 6, suggesting that male subjects are more impatient, those servicing a bank loan are more impatient and subjects who did not receive any remittances in the last 3 months are more impatient.[9]

Table 8 presents regression results for present bias where the shock exposure variable is a binary that takes a value 1 if respondent indicated that they were affected by COVID-19, and 0 otherwise. The dependent variable is the present bias

[9]We also find significant results when we restrict our regression to those who prefer early access to their long-term savings and not in the Banking sector, which had majority respondents.

Table 7. COVID-19 exposure on discount rate.

	Discount rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Affected by COVID-19 (=1)	0.055**	0.007	0.053**	0.028	0.107	0.047*
	(0.023)	(0.032)	(0.026)	(0.029)	(0.094)	(0.025)
Age	−0.006***	−0.000	−0.003**	−0.002*	−0.003	−0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.001)
Gender (1 = Male)			−0.015	0.023	−0.010	−0.008
			(0.022)	(0.034)	(0.066)	(0.014)
Married	0.033	−0.031**	0.005	−0.039	−0.011	−0.007
	(0.019)	(0.012)	(0.023)	(0.034)	(0.059)	(0.014)
Head	−0.072	0.008	0.018	0.011	0.005	0.019
	(0.051)	(0.013)	(0.025)	(0.038)	(0.062)	(0.013)
Household Size	0.006	0.000	0.001	0.012**	−0.017	0.003
	(0.003)	(0.008)	(0.004)	(0.005)	(0.021)	(0.003)
Servicing Loan (=1)	−0.013	0.005			−0.042	−0.009
	(0.026)	(0.024)			(0.067)	(0.017)
Other Income Apart from Salary	−0.038**	−0.009	−0.030*	−0.016	0.036	−0.040**
	(0.018)	(0.027)	(0.016)	(0.031)	(0.056)	(0.016)
Received Remittance Last 3months	−0.001	−0.019	−0.012	−0.010		
	(0.034)	(0.030)	(0.026)	(0.031)		
Organizational Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	357	241	432	166	79	519
R-squared	0.142	0.09	0.12	0.11	0.28	0.11

Notes: Organizational fixed effects included. Robust clustered standard errors are in parenthesis. Significance levels are ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$. Column 1 is restricted to male subjects. Column 2 is restricted to female subjects. Column 3 is restricted to subjects who are servicing a bank loan. Column 4 is restricted to subjects who are not servicing a bank loan. Column 5 is restricted to subjects who received remittances within the last 3 months. Column 6 is restricted to subjects who did not receive any remittances in the last 3 months.

Table 8. COVID-19 exposure on present bias.

	Present Bias				
	(1)	(2)	(3)	(4)	(5)
Affected by COVID-19 (=1)	−0.004	−0.093	0.053	−0.168*	0.323***
	(0.062)	(0.096)	(0.103)	(0.087)	(0.101)

Continued

Age	0.005	0.008**	−0.001	0.011**	0.004
	(0.003)	(0.003)	(0.007)	(0.005)	(0.004)
Gender (1 = Male)	−0.040	−0.046	−0.046		
	(0.053)	(0.045)	(0.098)		
Married	−0.003	0.017	−0.023	−0.069	0.087
	(0.039)	(0.061)	(0.136)	(0.054)	(0.111)
Head	−0.050	−0.050	−0.028	0.235*	−0.006
	(0.067)	(0.061)	(0.133)	(0.117)	(0.082)
Household Size	−0.005	−0.018	0.025	−0.028	−0.000
	(0.011)	(0.012)	(0.032)	(0.019)	(0.013)
Servicing Loan (=1)	−0.006	−0.047	0.064	−0.007	−0.099
	(0.040)	(0.050)	(0.107)	(0.068)	(0.105)
Other Income Apart from Salary	0.049	0.019	0.099	0.001	0.053
	(0.033)	(0.034)	(0.077)	(0.040)	(0.067)
Received Remittance Last 3months	−0.113**	−0.151***	−0.001	−0.215***	−0.056
	(0.050)	(0.037)	(0.177)	(0.039)	(0.053)
Organizational Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	590	467	123	275	192
R-squared	0.019	0.034	0.032	0.071	0.039

Notes: Organizational fixed effects included. Robust clustered standard errors are in parenthesis. Significance levels are ***$p < 0.01$, **$p < 0.05$, and *$p < 0.1$. Columns 1 includes whole sample. Columns 2 is restricted to subjects that preferred early access to their long term savings. Columns 3 is restricted to subjects that did not prefer early access to their long term savings. Columns 4 is restricted to subjects that preferred early access to their long term savings and are male. Columns 5 are restricted to subjects that preferred early access to their long term savings and are female.

parameter. We do not find any significant results showing any evidence of present biasness. Even when we restrict our sample to those who prefer (Column 2) and those who don't prefer (Column 3) early access to their long term savings, we do not find any significant results. In Column 4 and 5 we restrict our sample to those who prefer early access to their long term savings, with Column 4 restricted to male subjects and Column 5 restricted to female subjects. We find that male subjects who preferred early access to their long term savings are less present biased, while female subjects who prefer early access to their long term savings are positively and significantly present biased, implying that that they chose current gratification over future, higher payoffs.

7. Conclusion and Policy Recommendations

This study estimated the effects of exposure to COVID-19 on time preferences

by utilizing an experimental approach. The estimation results indicate that exposure to COVID-19 induces higher time discount, and has an effect on present biasness. Those who were severely affected by COVID-19 are more impatient and are more likely to seek for early access to their long-term savings. We also estimated alternative tests restricting our sample to males, those servicing a bank loan, and those who did not receive any remittances in the last 3 months and find that they are more impatient and are also likely to seek for early access to their long-term savings. Females who prefer early access to their long-term savings are found to be more present biased than the male counterparts. Based on our main findings, exposure to COVID-19 might have long-term negative consequences on individuals' attitudes and therefore making it inevitable for policy makers to take preferences into consideration when formulating saving programs. This is important because preferences plausibly support the identification of mechanisms that may affect individual savings behavior, which may help policymakers design effective policies from an informed viewpoint.

Evidence from our results implies that those who were financially and economically affected by COVID-19 are particularly likely to suffer from the effects of COVID-19, and are principally eager to access their long term savings now. Early withdrawal of savings from an individual's pool of long-term savings may result in a significant reduction in how much one will have in old age (retirement). Those contemplating withdrawing an amount from their pool of long-term savings should have regard to the longer-term financial implications of such a decision. The long term financial implications essentially have to do with the investment earnings foregone in respect of amounts withdrawn now.

Policy makers should therefore ensure that these groups are provided with targeted interventions such as consulting, financial literacy[10] and entrepreneurship programs which presumably are likely to improve not only their financial behavior but also trigger investment and saving behaviors, and long-term economic prosperity. Karlan et al. (2014) argue that although savings is becoming a priority in the development agenda, it is not clear a priori that under-saving is a widespread problem, and that everyone should save more, at least in the form of additional financial assets or investment. Anecdotal evidence suggests that some individuals are reluctant to set money aside for their retirement if they cannot use that money for emergencies, and therefore a forced saving mechanism (just like NSSF for formal workers) may be inevitable. Individuals also need to be encouraged to set aside emergency savings, separate from retirement savings, for situations of hardship e.g. COVID-19, temporary income loss and medical circumstances among others. In addition, carefully applying penalties on withdrawals that are not paid back or making withdrawals conditional on certain situations can deter individuals from dipping into their long term savings accounts.

[10]According to Hastings & Mitchell (2018), research and policy interest today is progressively focused on the linkages between financial literacy and household saving, seeking to explain why consumers seem to under-save for retirement, take on too much debt, make poor mortgage decisions, and experience other problems in the modern financial environment.

In terms of future research, it would be interesting to investigate the impact of these interventions on the long-term economic outcomes. It is noteworthy that in many low-income countries, preference data are limited or unavailable (Tanaka & Yamano, 2015). Therefore, the recent development of eliciting individual preferences through economic experiments, as this study does, will enable policymakers to take preferences into consideration when formulating financial literacy and savings programs.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix

Table A1. Payoff matrix for time preference experiment 1.

Row	Column A		Column B		Front-end Delay	Discount Rate Interval if Subject Switches	Mid-point
	Months (t)	Prize (M; 000')	Months (t)	Prize (M; 000')			
1-1	0	6000	4	7000	No	$0 < r \leq 0.0393$	0.0197
1-2	0	6000	4	8000	No	$0.0393 < r \leq 0.0746$	0.0569
1-3	0	6000	4	9000	No	$0.0746 < r \leq 0.1067$	0.0907
1-4	0	6000	4	10,000	No	$0.1067 < r \leq 0.1362$	0.1215
1-5	0	5000	4	10,000	No	$0.1362 < r \leq 0.1892$	0.1627
1-6	0	4000	4	10,000	No	$0.1892 < r \leq 0.2574$	0.2233
1-7	0	3000	4	10,000	No	$0.2574 < r \leq 0.3512$	0.3043
1-8	0	2000	4	10,000	No	$0.3512 < r \leq 0.4953$	0.4233

Notes: The table shows all the payoffs (M) and timing (t) in months of payment for choices A and B in experiment 1. The range of discount r is calculated by equating the discounted value from lottery A and lottery B.

Table A2. Payoff matrix for time preference experiment 2.

Row	Column A		Column B		Front-end Delay	Discount Rate Interval if Subject Switches	Mid-point
	Months (t)	Prize (M; 000')	Months (t)	Prize (M; 000')			
1-1	4	6000	8	7000	Yes	$0 < r \leq 0.0393$	0.0197
1-2	4	6000	8	8000	Yes	$0.0393 < r \leq 0.0746$	0.0569
1-3	4	6000	8	9000	Yes	$0.0746 < r \leq 0.1067$	0.0907
1-4	4	6000	8	10,000	Yes	$0.1067 < r \leq 0.1362$	0.1215
1-5	4	5000	8	10,000	Yes	$0.1362 < r \leq 0.1892$	0.1627
1-6	4	4000	8	10,000	Yes	$0.1892 < r \leq 0.2574$	0.2233
1-7	4	3000	8	10,000	Yes	$0.2574 < r \leq 0.3512$	0.3043
1-8	4	2000	8	10,000	Yes	$0.3512 < r \leq 0.4953$	0.4233

Notes: The table shows all the payoffs (M) and timing (t) in months of payment for choices A and B in experiment 2. The range of discount r is calculated by equating the discounted value from lottery A and lottery B.