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Inflation and behavior: An experimental analysis

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Abstract

We experimentally analyze the impact of inflation on individuals' savings and consumption behavior as a means of linking their perceptions and expectations of inflation to their savings-consumption behavior at the individual level. People's behavioral reactions to inflation can vary significantly, and their ability to adapt their behavior to inflation appropriately can mitigate the negative impacts of rising prices. Their adaptability may be influenced by the pattern of inflation (e.g. expected or unexpected, high or low), their experience with and perception of inflation, and many other individual characteristics may affect their ability to react to and protect themselves from harmful inflationary conditions. Through an online experiment, we distinguish the underlying situational and personal factors that correlate with people's adaptability to changes in inflationary conditions, observe people's savings and consumption decision-making processes, and determine whether an intervention can improve their decisions and adaptability in such changing conditions. We develop a novel experimental task that simulates households' inflationary experience and compare subjects' performance to a benchmark best strategy to measure individual adaptability. To explore the individual determinants of these recognition and adaptation abilities, we collect a series of additional behavioral measures and correlate these individual characteristics to task performance. Ultimately, we find that individuals demonstrating greater numeracy perform best in changing inflationary conditions as well as respond best to our financial-education intervention, whereas subjects with the most inconsistent economic preferences perform significantly worse on both counts.

1. Introduction

For over three decades (the 1990s to 2020s), developed economies enjoyed low and stable inflation. This historically unusual calm was abruptly shaken by a series of economic headwinds. Beginning in 2020, the onset of the COVID-19 pandemic segued into the first significant rise in inflation in at least a generation one year later. Subsequently, the Russia-Ukraine conflict further accelerated inflation. Given the extended period of low inflation

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experienced in developed countries, it is likely that individuals have struggled to anticipate, or even perceive, its sudden rise and to effectively adjust their consumption and saving decisions to mitigate its impact. For the same reasons, the analysis of how agents form their perceptions and expectations and adapt their behavior in response to inflation, especially at the individual level, has long been neglected, despite the important role of inflation perceptions and expectations in macroeconomic models and for the ability of central banks to reach their objective of price stability (Abildgren & Kuchler, 2021; Weber et al., 2023).

Indeed, some of the numerous, mainly macroeconomic, studies on inflation dating back to the 1970s—a period marked by a significant surge in inflation in many developed economies—had already highlighted pronounced shifts in households' savings and consumption behaviors as a function not only of the inflation rate they faced, but of the rate they anticipated facing. In particular, increases in the rates of households' expected inflation correlated with increases in nondurable goods consumption, or "stocking up." Decreases in anticipated inflation similarly correlated with increased savings rates (Juster & Wachtel, 1972; Katona, 1974). In other words, when households expected a rise in prices, they would naturally make purchases in advance to avoid paying at higher prices later; conversely, when they did not anticipate price increases, they would rather save money.

This dichotomous correlation between households' inflation expectations and savings-consumption decisions was for instance observed in the United States, when in addition to the headline geopolitical tumult, the infamously long lines at gas stations of the 1979 Oil Crisis distinctly correlated with high levels of expected inflation (*Expected Change in Prices during the next Year*, 2023; Verleger, 1979). Similarly, the United States saw an increase in the personal savings rate at the same time as a drop in the expected inflation rate (*Expected Change in Prices during the next Year*, 2023; U.S. Bureau of Economic Analysis, 2024).

On the other hand, there is equally substantial evidence that individuals do not make appropriate decisions when faced with inflation. Households typically demonstrate quite inaccurate estimations of inflation. In particular, a broad range of survey-based evidence indicates that households' inflation perceptions persistently exceed the inflation level measured by official consumer prices indices and their expectations are subject to similar biases, as shown by Jungermann et al., (2007), Abildgren & Kuchler (2021), and Cornand & Hubert (2022).

Such biases can confound households' decision-making. One can logically expect that over-anticipating inflation will lead to over-consumption, while under-anticipating will lead to under-protecting wealth and income from losses in real value. Moreover, Katona (1974) postulated at the time that when consumers underestimated future inflation, they would fail to recognize the role inflation was playing on their subsequently worsening financial state. Consumers misinterpreted their increasing financial hardship as being simply the result of a "bad economy" or poor personal financial management and, thus, believed they needed to save more and/or act in a more financially responsible manner—as opposed to limiting exposure to losses in real value.

During the 1970s and 1980s in developed economies, these mistakes were commonplace. While households would increase savings in anticipation of a decrease in inflation, they regularly under-anticipated and ultimately saved at negative real interest rates (*Expected Change in Prices during the next Year*, 2023; Stephens & Tyran, 2017; U.S. Bureau of Economic Analysis, 2024).

As a result, central bankers have long focused on managing expectations of inflation as a means of maintaining stable consumer behavior and, ultimately, prices (Bernanke, 2007). Given the importance monetary policy assigns to anchoring household inflation expectations, the contemporary literature has thus focused primarily on perceptions and expectations of inflation at a macroeconomic scale.

But, while one should theoretically exist, the contemporary research has not yet identified a clear connection between perceived and expected inflation and the resulting economic behavior (Gautier & Montornès, 2022). At first glance, these behavioral patterns seem both natural and reasonable; however, their ultimate economic effectiveness depends on households' ability to accurately anticipate and perceive inflation. Thus, two foundational questions remain unanswered: do individuals make appropriate decisions when faced with inflation, and is an individual's adaptability to inflation related to their perceptions and expectations of inflation?

There is almost no micro-level data on individuals' decision-making when faced with inflation because the range of data required to assess one's adaptability is too wide for large-scale collection. A few notable exceptions, however, do exist of laboratory (Georganas et al., 2014; Kawashima, 2006) and natural (Jungermann et al., 2007) experiments. Kawashima (2006) who finds inflation increases subjects' delay discounting in a laboratory-based intertemporal consumption task. Jungermann et al. (2007) show that the availability heuristic and loss

aversion lead to overestimations of perceived inflation, while Georganas et al. (2014) provides further evidence that the availability heuristic distorts individuals' perceptions of inflation.

Nevertheless, the large majority of research is macroeconomic, relying on survey data to measures households' perceptions and expectations. In theory, better perceptions and expectations should correlate positively with adaptability; however, the lack of micro-level behavioral data makes establishing the relationship between perceptions and expectations of inflation and individuals' behaviors more difficult. Experimental economics, however, offers an efficient way to study this relationship at the individual level. Therefore, we develop a novel, controlled experiment that measures individuals' adaptability to and perceptions and expectations of inflation. We expect to observe that many subjects do not adapt effectively to inflation, that there is significant heterogeneity across subjects, and that subjects' inflation perceptions and expectations influence how they adjust their decisions when faced with rising prices.

What contemporary macro-level research has revealed is that households demonstrate quite inaccurate perceptions and expectations of inflation. These issues can not only complicate monetary policy transmission, but lead household decision-making astray (Abildgren & Kuchler, 2021). Perceived and expected inflation have consistently exceeded measured inflation rates, and both have varied widely and consistently across certain demographic and cognitive factors (D'Acunto et al., 2022). Women, the poor, the less-educated, and those with lower IQs demonstrate greater estimation biases. Those who have previously experienced high-inflation periods typically produce higher estimates (Bruine de Bruin et al., 2010; D'Acunto et al., 2022).

How these perception and expectation biases ultimately affect behavior, however, remains unclear. At the macro-level Burke and Ozdagli (2021) find little impact on consumption behavior in the United States, whereas Dräger and Nghiem (2021), Ichiue and Nishiguchi (2015), and Andrade et al. (2023) find positive relationships in Germany, Japan, and France respectively between the inflation rate households expect and their consumption. Therefore, we additionally expect that individual characteristics related to divergent inflation perceptions and expectations—particularly cognitive abilities, loss and risk aversion, and delay discounting—correlate with an individual's adaptability to inflation as well. To address this question, we measure subjects' characteristics and cognitive and economic capacities, correlating them with their performance, perceptions, and expectations in our experimental inflation task.

Further, although there is little research into how inflation affects people's behavior at the individual level, there exists a sizable literature that finds that financial literacy and numeracy as well as a number of economic preferences correlate positively with financial behavior (Darriet et al., 2020; Lusardi & Mitchell, 2014; Nieddu & Pandolfi, 2021). As such, we further anticipate that a financial education intervention can improve individuals' decision-making and adaptability to inflation.

To measure individuals' adaptability to inflation, we design a novel intertemporal consumption-savings experimental task that allows us to control the inflationary conditions and observe subsequent behavioral changes as inflation changes. We apply this task in a scalable online experiment to test the following hypotheses:

1. subjects do not perform well in the inflation task, and less accurate perceptions and expectations of inflation correlate to a lower performance in the task and, thus, less adaptability to inflation,
2. heterogeneity of behavior in the experimental task can be explained by differences in individual characteristics, and
3. subjects are capable of improving their behavior through learning and a financial-education intervention.

Overall, we find that subjects perform well below the benchmark performance and that the less accurate a subject's perceptions and expectations of inflation, the worse they perform as well. Compared to real-life behavior, subjects demonstrate similar in-task perception and expectation inaccuracies. Surprisingly, whereas in phases of low inflation, subjects demonstrate the standard inflation overestimation biases (Abildgren & Kuchler, 2021), during phases of high inflation, they demonstrate exponential growth bias (Schonger & Sele, 2021; Stango & Zinman, 2008) and underestimate inflation instead. Across subjects, we observe significant performance heterogeneity and find statistically significant positive correlations between their numeracy and performance as well as negative correlations between their degree of inconsistency in economic preferences and performance. Finally, we find that subjects improve their performance over repeated sessions of the task (a "learning effect"); subjects with greater mathematical abilities and greater adaptability improve their performance further after receiving the financial-education intervention, while other subjects do not improve performance with the intervention.

In the sections that follow, we present our experimental task and protocol (Section 2), the results (Section 3), and a discussion of the implications for our three hypotheses and for future research (Section 4).

2. Method

The experiment takes place online over the course of four days for each subject and comprises our primary inflation-behavior task (the "Savings Game") and a battery of supplemental questionnaires and behavioral tasks. We first present the Savings Game (Section 2.1) and our method for analyzing behavior in the game. Then, we present the experiment's procedural implementation (Section 2.2) and the battery of additional questionnaires and tasks (section 2.3).

2.1. Savings Game

We design the Savings Game so that we can measure subjects' adaptability to inflation. When faced with inflation, a rational economic agent should make savings and consumption decisions so as to maximize their purchasing power—even if empirical evidence shows this is not always the case (Bourgeois-Gironde & Guille, 2011). In particular, at the individual level, surveys and experiments show that many individuals fail to correctly take inflation into account when making financial decisions, demonstrating money illusion (Darriet et al., 2020; Shafir et al., 1997).

The objective is to expose individuals to various price changes in order to simultaneously measure how they perceive and anticipate inflation based solely on prices and how they adjust their decisions accordingly.

To this end, the Savings Game presents an intertemporal savings and consumption task, where the optimal decision varies between saving and purchasing depending on inflation. We maintain the nominal interest rate fixed, so optimal decision-making is in fact a function of the real interest rate.

2.1.1. Main rules

Subjects are remunerated based on the balance in their interest-earning experimental savings account at the end of each round of the game. We define a game round to span 120 periods (presented to subjects as "months"), during each of which subjects must decide between saving money or making purchases of the experimental good, one unit of which they must consume each period to survive.

Over the 120 periods, prices increase at varying rates, while the nominal interest rate remains constant, producing phases of positive or negative real interest rates. Whereas experiments using intertemporal consumption tasks remunerate via consumption (Brown et al., 2009; Kawashima, 2006), the Savings Game treats consumption as a condition, which subjects must meet to proceed through and ultimately finish a given round. This approach aims to both incentivize subjects to pay attention to the real interest rate as well as more closely replicate real-life purchase decision-making processes, where saving money itself can bring utility.

Subjects start in period $t = 1$ with a savings account holding an initial endowment, w, and receive an additional period income of y. These funds can be used to purchase units of the experimental good (presented to subjects as "food") at the unit price p_1. Unspent funds remaining in the savings account and accrue interest at a constant nominal rate r per period. From period $t = 2$ onward, subjects have savings equal to the capitalized savings plus the per-period income y.

Each period, subjects decide the quantity q_t of the good to purchase, ensuring they have at least one unit of the good in their stock ($B_t \geq 1$), for utilization in the period. The good is nonperishable, and subjects can stock as much as they like. If at any point, they end a period with $B_t < 1$, they cannot survive to the next period. At this point, the round of the game ends immediately, and their savings account balance is recorded as 0, meaning they receive no remuneration for the failed round.

The unit price p_t of the good can change each period. It can only increase with a positive inflation rate π_t , such that $p_t = p_{t-1}(1 + \pi_t)$. The inflation rate π_t is exogenously determined and can be inferior or superior to the nominal rate r. Subjects are informed that prices can change but only increase so that we can ensure their decisions are never influenced by an expectation of deflation.

To sum up, the Savings Game can be described by the following steps:

1. At $t = 1$, the subject begins with an initial endowment, $S_1 = w + y$.
2. The total funds available at the beginning of any given period is $S_t^o = S_{t-1}^f(1 + r) + y$.
3. The total spent for any given period is $p_t q_t$ and the stock of the good is $B_t = B_{t-1} - 1 + q_t$.
4. The end of period savings balance is $S_t^f = S_{t-1}^f(1 + r) + y - p_t q_t$.

5. The subject's final gain equals their savings account balance at $t = 120$. Any remaining potential stock of goods is lost.

The challenge of the game lies in balancing the need to maximize savings with the potential to stock up on goods before the price increases. It is advantageous to save when the real interest rate is positive and to stockpile as soon as the real interest rate becomes negative.

Prior to playing the first round of the Savings Game, subjects receive detailed instructions on the game's rules as well as how to operate the game's interface (for a detailed explanation, see Appendix A.2. Savings Game instructions). They are informed about the game's objective and their remuneration, how savings are accumulated, the need to finish each period with a minimum stock of $B_t = 1$, the constancy of the nominal interest rate and endowment per period, and the possibility that prices can increase (but not decrease) each period. They must also correctly answer comprehension questions during the instructions prior to starting the first session. We do not provide further information regarding inflation and the real interest rate so that we can estimate if and when subjects recognize the change in inflationary conditions and real interest rate. This approach is based on Behrens et al. (2007), who measure individuals' adaptability to changing environments through a one-armed bandit task, whereby over time, the probability of an option being the correct choice switches on a regular basis. We apply this same process of changing environment, where inflation is the environmental variable we control.

2.1.2. Experimental parameters

Figure 1 shows the Savings Game's user interface through which subjects receive information and make choices for each period. The Savings Game interface is developed using oTree, an open-source software development framework built on Python and Django (Chen et al., 2016); the codebase is freely available for use at https://github.com/o-nate/savings-game (Lawrence, 2024).

We utilize the "₮" symbol as our experimental currency unit to align monetary values with the format encountered in subjects' daily lives, while also avoiding a generally recognizable currency symbol for within our subject population.

The parameters are as follows:

- initial endowment, w, of ₮863.81,
- per-period income, y, of ₮4.32,

- savings account interest rate, r, 1.9% per period,
- initial price of the good, p_1, ₮8.07.

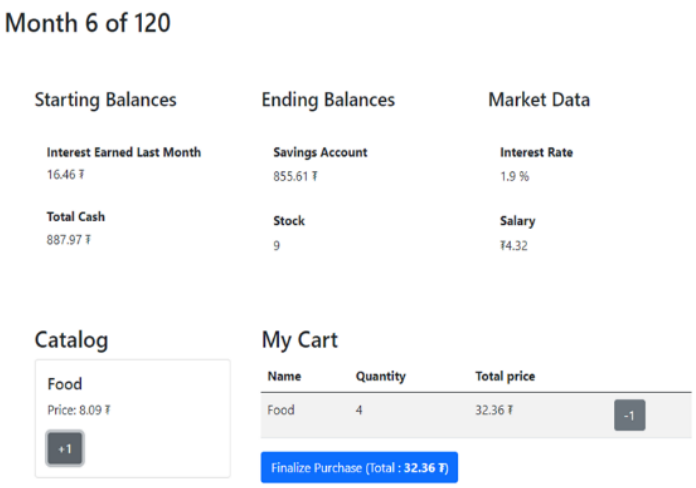

Figure 1 - Savings Game user interface

On the screen, the total interest earned in the previous period and total cash available are displayed in Starting Balances. Additionally, given the currently selected quantity and current price, the amount to be saved for the next period and current stock of the good are automatically calculated for the subject and displayed in Ending Balances. The total to be spent, given the current selection in My Cart is displayed on the Finalize Purchase button. Once satisfied with their selected quantity, the subjects finalize their purchase and proceed to the following period by clicking Finalize Purchase. If at any time, a subject ends a period with a stock balance, $B_t < 1$, a pop-up message appears on the screen warning them that if they continue, they will not survive to the next period, recommending they review their decision. If the subject does not have enough Total Cash to purchase any units of the good, they must then confirm they understand that the Savings Game round will end.

There are two possible inflation sequences. Over the course of four Savings Game rounds, subjects engage in each inflation sequence twice. One has four inflationary phases of 30 consecutive periods each ("4x30"), with two phases of high inflation (negative real interest rate) and two of low inflation (positive real interest rate). The other sequence has ten inflationary phases of 12 consecutive periods each ("10x12"), with five phases of high inflation (negative real interest rate) and five of low inflation (positive real interest rate). Figure 2 demonstrates the price evolution of one unit of the good in each sequence. This approach, using sequences of different inflation and thus real interest rate phases, is based on Behrens et al. (2007). As mentioned above, in the Behrens et al. (2007) experiment, the probability of an

option being the correct choice switches on a regular basis—the result of changing environmental conditions. Similarly, the correct choice in the Savings Game changes between saving and buying with each change in inflation phase—the environmental variable we control. This approach allows us to compare subjects' adaptability to a changing environment that requires changing strategy.

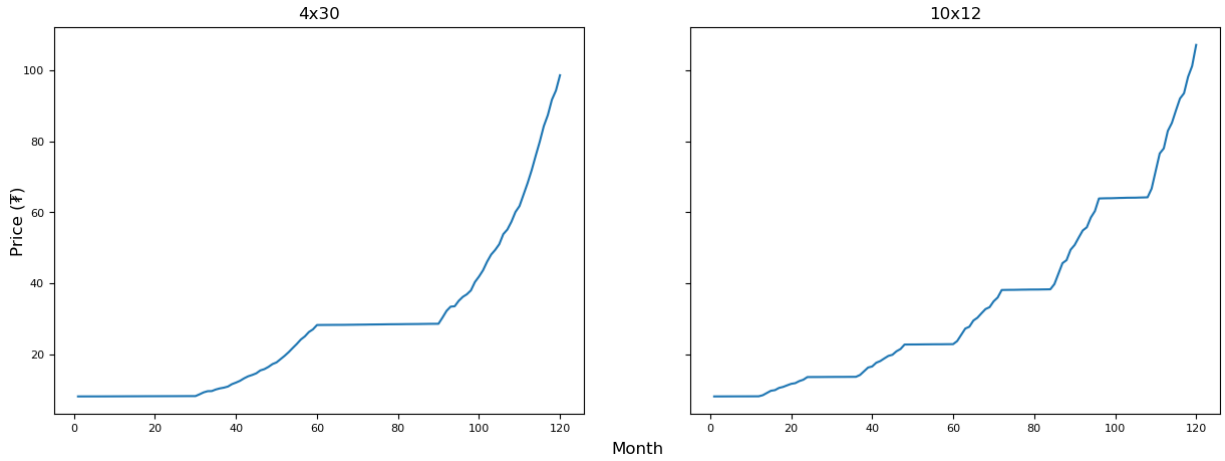

Figure 2 - Price evolution of inflation sequences

During low-inflation phases, the average per-period inflation rate is approximately 0.04%, exhibiting very low variability (between 0% and 0.08%). In high-inflation phases, the average per-period inflation rate is around 4.2% for the 4x30 sequence and 4.4% for the 10x12 sequence, with higher variability (ranging between 0.3% and 6.3% for 4x30, and between 1.6% and 7.4% for 10x12).

The experimental parameters are configured to create an environment where adopting a "naïve" strategy of simply purchasing one unit of the good per period, allows survival but produces a final savings balance well below the maximum possible. Indeed, the inflationary conditions were defined such that purchasing no more than one unit in a given period ("saving") is only appropriate in low-inflation phases, producing high opportunity costs during high inflation. In both sequences, the maximum-performance ("best") strategy involves saving during the initial low inflation phase and, at the onset of the first high-inflation phase, acquiring all units of the good necessary to survive the remaining periods in a single transaction ("stocking up"). The best strategy yields for the 4x30 and 10x12 sequences ₮4119.38 and ₮2420.59, respectively, a naïve strategy yields only ₮2,261.29 and ₮276.55, respectively.

Given the lack of information subjects receive about the future price of the good, the best strategy is not something we expect subjects to achieve, at least the first time they play the

game. As such, we anticipate that subjects' performance should fall somewhere between the naïve and the best strategies' performances. Our primary outcome measure, therefore, is the final balance in subjects' savings account.

2.1.3. Intervention

Before the start of the third round of the Savings Game, half of subjects are randomly selected to receive a simple financial education intervention.[1] The financial education provides short textual explanations of inflation and interest and how they both relate to purchasing power (See Appendix A.3. Intervention for the complete intervention). Subjects are told that in order to maximize their savings, they must protect their purchasing power. Doing so means they must save when the inflation rate is less than the interest rate and, as soon as the inflation becomes greater than the interest rate, they must stock up. In other words, they should save money as long as $r > \pi_t$ and stock up as soon as $r < \pi_t$.

After reading the brief texts, subjects must then answer some comprehension questions in which they are shown screens from the Savings Game as well as given contextual information and must determine the status of their purchasing power and what they should do in the situation. See Appendix A.3. Intervention for the complete treatment provided.

2.1.4. Performance and adaptation to changing inflation phases

Our baseline performance measure is subjects' savings balance at the end of the 120 periods. Subjects' abilities to protect their purchasing power and adapt to changes between low- and high-inflation phases determine how much they can ultimately save. As such, subjects' inability to protect purchasing power and adapt produce opportunity costs that result in lower final savings. These opportunity costs arise from three possible mistakes: stocking too much ("wasteful-stocking"), stocking in low inflation ("over-stocking"), and saving in high inflation ("under-stocking").

The maximum achievable balance, produced by the best strategy for each inflation sequence, provides a benchmark. We can then directly calculate the opportunity cost of each error by decomposing a subject's divergence from the benchmark best strategy's result, as described below.

The most obvious mistake is buying more of the good than necessary. *Wasteful-stocking* occurs when a subject purchases more units of the good than required to survive the 120 periods, such

[1] For hands-on demo of the intervention, visit https://savings-game.onrender.com/demo/intervention.

that $B_{120} > 1$. Figure 3 provides an example in which a hypothetical subject purchases nine units of the good in excess in the 4x30 inflation sequence. The wasteful-stock becomes apparent as the blue bars surpassing the "best" strategy's stock, represented by the orange bars at period $t = 98$. When a subject purchases excess units, they forfeit the savings corresponding to the additional purchases and the potential interest they could have accrued on that savings. Calculating the opportunity cost for wasteful-stocking involves determining what the total gain would have been if these unnecessary purchases had been avoided. Figure 4 demonstrates the impact on the stock and savings of eliminating these superfluous purchases. Whereas the original final savings balance was ₹1778.43, by eliminating the excess purchases, the final savings now increase to ₹2487.70. This difference between the real and hypothetical performance with no excess purchases indicates ₹709.27 of wasteful-stocking cost.

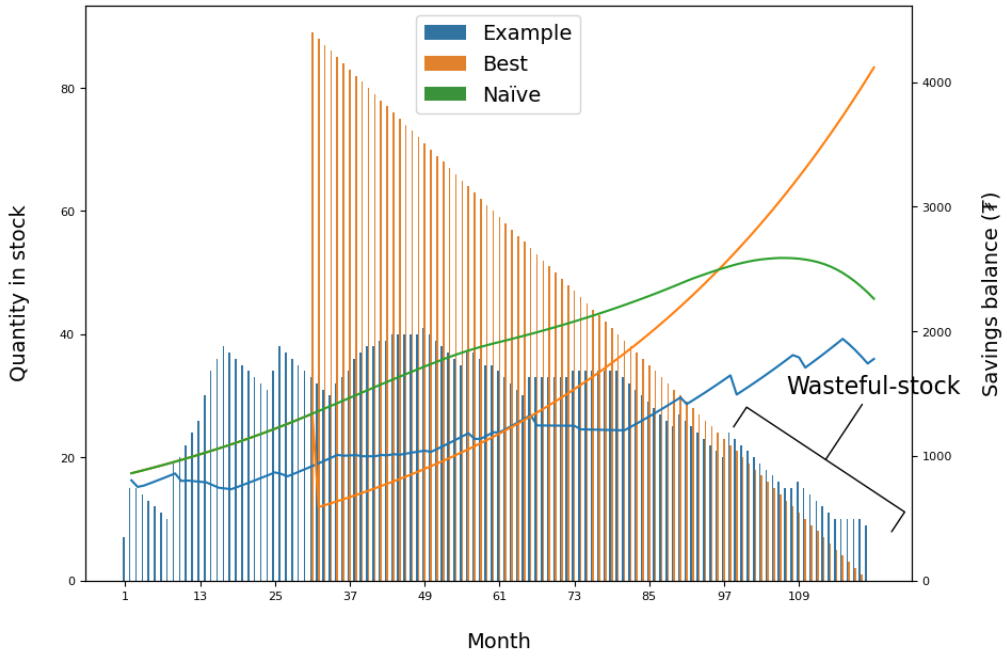

Figure 3 - Example subject performance compared to best strategy in the 4x30 sequence

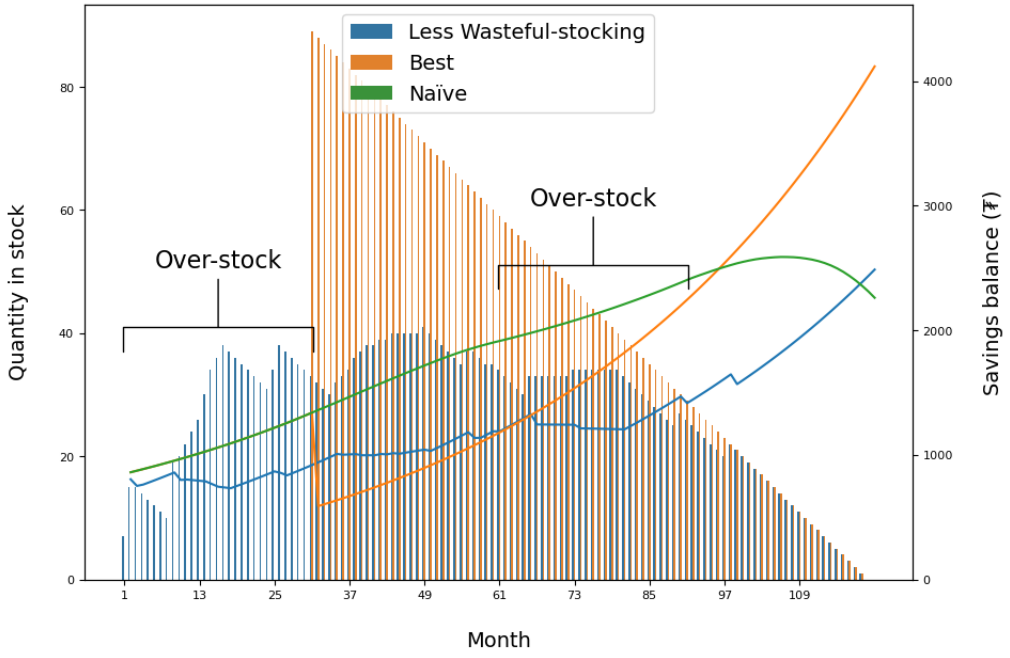

Figure 4 - Example subject performance with wasteful-stocking removed

The second mistake, *over-stocking* occurs during periods of low inflation, when the real interest rate is positive. During low inflation, the interest earned on savings accrues more quickly than the price of the good increases, meaning that purchasing more than the one unit per period necessary to survive incurs an opportunity cost of foregone interest income. The hypothetical subject in Figure 3 and Figure 4 demonstrates over-stocking, amassing a stock in the first low-inflation phase, prior to period $t = 31$, rather than purchasing only one unit of the good per period. As a result, they sacrifice the interest that could have been accrued on the money otherwise spent too soon. The same applies to the second phase of low inflation, during periods $61 \leq t \leq 90$, when the subject makes additional purchases despite having sufficient stock to survive the low-inflation phase while accruing interest on the money they spend. The unnecessary purchases made during this second phase of low inflation would have been preferable to postpone until period $t = 91$. We can calculate the opportunity cost of over-stocking by determining what their total gain would have been had they deferred additional purchases during the phases of low inflation until the start of the subsequent high-inflation phase. Figure 5 shows how eliminating this over-stocking affects stock and savings. Without the over-stocking, the final savings increases to ₮3536.24, implying a corresponding opportunity cost of ₮1048.54.

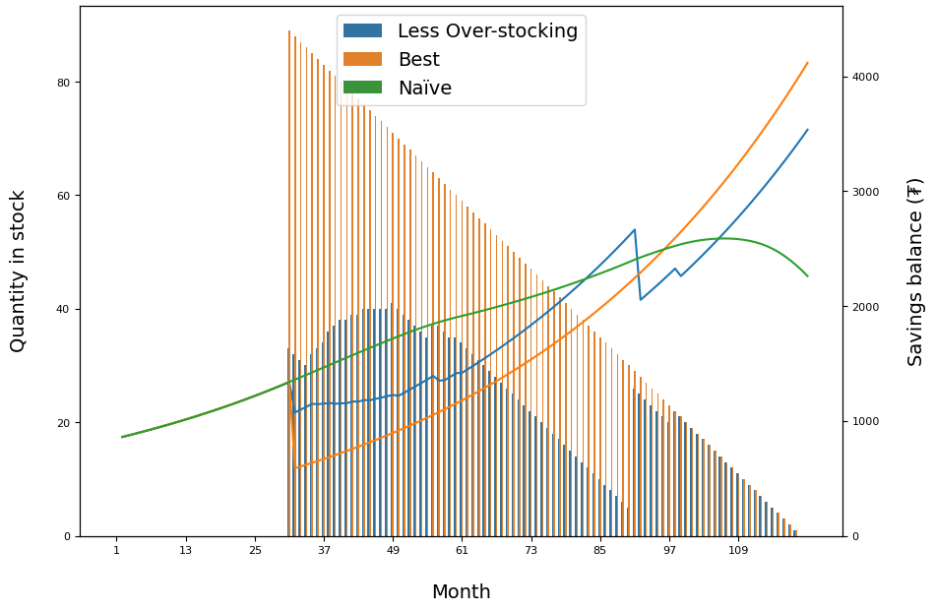

Figure 5 - Example subject performance with wasteful- and over-stocking removed

The third mistake, *under-stocking*, relates to insufficient stocking at the beginning of high-inflation phases. This error incurs a cost as subjects ultimately pay a much higher price for the good. The opportunity cost of under-stocking is the difference between the interest that could have been earned on the money saved by purchasing at a lower price and the additional interest earned by saving for a longer period. We can calculate the associated opportunity cost by determining what the final savings would have been had the subject appropriately stocked up at the onset of high inflation by calculating the difference between the sequence's maximum savings and the subject's savings adjusted to remove wasteful- and over-stocking. For the hypothetical subject in Figure 5, the difference between the maximum of ₮4119.38 and adjusted final savings of ₮3536.24 is ₮583.14, which is the under-stocking opportunity cost.

For further information, see Appendix A.4. Opportunity cost calculation for further discussion on the opportunity cost calculations.

Finally, as can be seen in the Figure 3, Figure 4, and Figure 5, the best strategy requires stocking up a large amount at the onset of inflation (108 units at $t = 13$ in sequence 10x12 and 90 units at $t = 31$). This requires subjects quickly and significantly adapt their purchase behavior to avoid future under-stocking costs. We can measure subjects' immediate purchase adaptation to changes in inflation phases by calculating the difference between the quantity purchased on average in the first 3 periods of high inflation and that purchased in the last 3 periods of the preceding low-inflation phase. As a benchmark, the best strategy requires purchase adaptations of 29 and 35 units in 4x30 and 10x12 respectively.

2.1.5. Measures of perception and expectation of inflation

Every twelve periods in the Savings Game, we measure subjects' perceived inflation rate for the preceding twelve periods and expected inflation rate for the next twelve periods. Both measures are elicited through a *slider*, horizontal percentage scale ranging from -100 % to + 100 % in 1% increments as shown in Appendix A Figure 4 in Appendix A.5. Additional in-task measures.

From these two measures, we construct bias and sensitivity indicators. Perception and expectation bias are the difference between actual (past and future inflation) and subjective values (perceived and expected).

Perception bias is $P_{bias}(\pi_t, \pi_t^p) = \pi_t - \pi_t^p$, and expectation bias is $E_{bias}(\pi_{t+1}, \pi_t^e) = \pi_{t+1} - \pi_t^e$, where π_t^p and π_t^e are subjects' reported perception and expectation of inflation at period t (for the corresponding 12 periods before or after respectively).

We calculate global values for each indicator as well as values for bias in the high- and low-inflation phases specifically.

Perception and expectation sensitivity are the Pearson correlations between actual (past and future inflation) and subjective values (perceived and expected).

A positive (negative) bias implies an overestimation (underestimation). The larger a bias's magnitude, the greater the divergence in estimation from the actual inflation rate. A positive (negative) sensitivity means that a subject correctly (incorrectly) adjusted their estimations in the same direction as changes in actual inflation. The closer the sensitivity to 1, the more accurately a subject adjusted their perception or expectation. Sensitivity near 0 suggests a subject did not adjust their perception or expectation at all, while sensitivity near -1 suggests a subject adjusted their perception or expectation converse to the changes in actual inflation.

We take additional perception measures during the task that were not included in the final analysis for this paper. See Appendix A.5. Additional in-task measures for further information.

2.2. Experimental procedure

We pre-register the experiment on AsPredicted and conduct it online in French using the hosting services of the S2CH Research Federation. We recruit subjects from the volunteer pool of the Laboratory of Experimental Economics in Paris (LEEP) through an online system (ORSEE).

The experiment lasts four days. Figure 6 depicts the procedure over the course of these four days. Each day, subjects receive an email with a unique URL link to the experiment's session, which they must complete on a computer (we block access from mobile phones and tablets). On average, subjects spend between 15 and 30 minutes on the experiment each day; however, there is no time limit.

Subjects complete the two inflation sequences (4x30 and 10x12) in randomized order during days 1 and 2 and again on days 3 and 4, again in randomized order. The battery of additional tests includes knowledge questionnaires and economic preference tasks. Knowledge questionnaires include specific questionnaires to measure subjects' financial literacy, inflation awareness, and numeracy. Economic preference tasks include a risky choice lottery and bomb risk elicitation task (BRET) to measure risk preferences, risky choice lottery with loss to measure loss aversion, Wisconsin card sorting task (WCST) to measure adaptability, and smaller-sooner/larger-later binary choice task to measure time preferences. We describe the tests in further detail below and in Appendix A.6. Knowledge measure questionnaires and Appendix A.7. Economic preference tasks. Subjects are additionally remunerated based on the results they achieve in the economic preference tasks, except for the binary choice task.

Subjects receive payment in euro upon completing all four days' tasks and questionnaires. The final gain is the sum of nine components: the sum of the four Savings Games' gain in euros, with an exchange rate of $₮750 = €1$; the outcomes of the risk aversion lottery, loss aversion lottery, BRET, and Wisconsin card sorting task; and a €12 participation fee. The maximum final savings possible over four rounds of the Savings Game is ₮13,080.46 (€17.44), and the maximum final remuneration, including participation fee and additional tests, is ₮33,817.50 (€45.09).

Day 1 begins with initial instructions on the overall experimental procedure and a demographics questionnaire.[2] Then, subjects receive instructions on the Savings Game and play their first round. Afterwards, they complete one of the economic preference tasks, which is randomly assigned.

Subjects begin day 2 with one of the randomly assigned knowledge questionnaires. They then play the second round of the Savings Game and complete the remaining two knowledge questionnaires in random order.

[2] For a hands-on demo of the Savings Game instructions, visit https://savings-game.onrender.com/demo/instructions.

When subjects enter the session on day 3, the half of subjects randomly assigned to the treatment group receive the financial education intervention, and the control group is simply shown a screen informing them that the next round of the Savings Game will now begin. They then complete the third round of the Savings Game. Next, they complete the remaining economic preference tasks in randomized order.

Finally, day 4 follows the same procedure as day 2. Subjects begin with one of the randomly assigned knowledge questionnaires. Next, they play the fourth and final round of the Savings Game and complete the remaining two knowledge questionnaires in random order. Afterwards, they are shown a summary of their performance in the four rounds as well as remunerated economic preference tasks and informed of their total remuneration. From there, they are redirected to a separate web portal to receive payment.

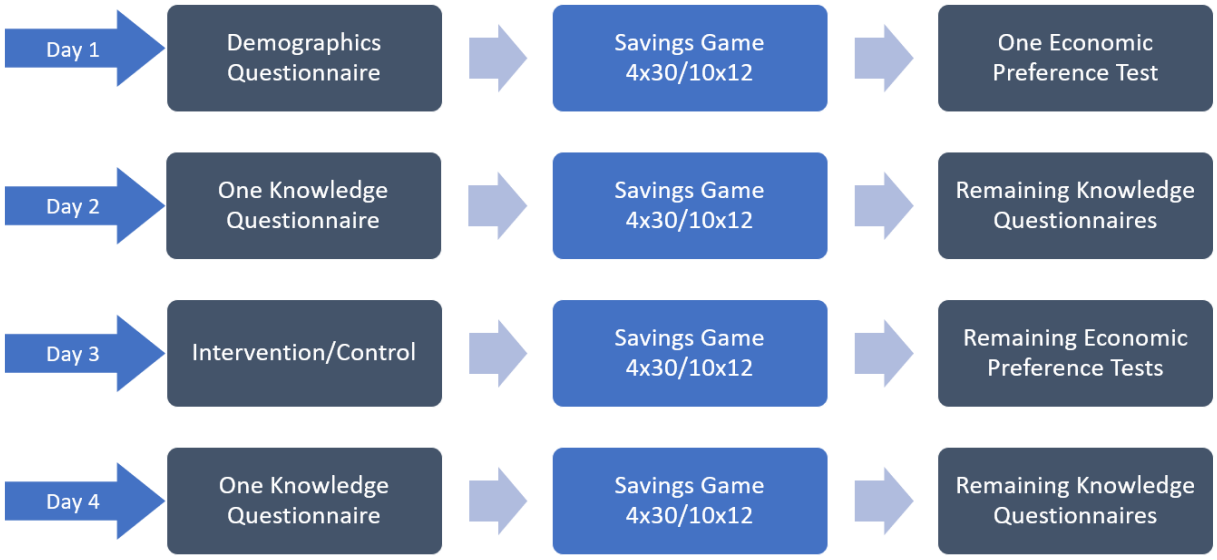

Figure 6 - Experimental design. Economic preference tests include time preferences, risk preferences (Holt & Laury, BRET), loss aversion, and Wisconsin card sorting task. Knowledge questionnaires include financial literacy, numeracy, and inflation

2.3. Questionnaires and other tasks

2.3.1. Demographics

The initial demographics questionnaire elicits subjects' demographic and socioeconomic information. This includes gender, age, education level, employment status, income, savings, and debt.

2.3.2. Knowledge

There are three knowledge questionnaires: financial literacy, inflation awareness, and numeracy.

The financial literacy questionnaire includes the "Big Three" questions from Lusardi and Mitchell (2009) as well as an investment product risk categorization from Arrondel and Masson (2014). A subject's financial literacy is determined by their correctly responding to the "Big Three" questions from Lusardi and Mitchell (2009). We also include a question on investment product risk categorization from Arrondel and Masson (2014). If a subject fails to answer correctly question 3 of the Big Three but correctly categorizes the investment products' risk, we consider them financially literate.

The inflation awareness questionnaire presents questions to assess subjects' knowledge of, ability to mathematically reason about, and real-life behavioral responses to inflation. Subjects provide multiple inflation estimates: the highest and lowest rates in France over the last 30 years, the current rate, and the rate they expected over the following 12 months (Macchia et al., 2018). They also answer questions that require compounding calculations (Macchia et al., 2018) or about their perceptions and expectations of changes in their purchasing power. Finally, they answer questions on how they would adjust various behaviors related to saving and spending if prices were to rise over the next 12 months. We use these responses to construct measures of their inflation perception, ability to conduct compounding calculations, and real-life adaptability to inflation.

The numeracy questionnaire consists of an adaptive version of the Berlin Numeracy Test (Cokely et al., 2012), which assesses subjects' probability reasoning. We use their responses to construct a numeracy measure.

See Appendix A.6. Knowledge measure questionnaires for further details.

2.3.3. Economic preference tasks

The economic preference tasks include:

- an intertemporal randomized choice sequence similar to Cohen et al. (2016) to measure time preferences;
- a Holt and Laury (2002) lottery choice procedure to elicit risk aversion;
- a bomb risk elicitation task (BRET) by Crosetto and Filippin (2013) to measure risk tolerance;
- a lottery choice task with loss to measure loss aversion, similar to Gächter, Johnson, and Herrmann (2022); and
- a Wisconsin card sorting task (WCST) to assess subjects' adaptability to changing environments (Axelrod et al., 1992; Leshem & Glicksohn, 2007).

Additionally, we develop a proxy measure for determining an the inconsistency of subjects' economic decisions (Kurtz-David et al., 2019) based on the number of times the subjects make conflicting decisions—the number of *switches*—during the economic preference tasks.

For further detail, see Appendix A.7. Economic preference tasks.

2.4. Hypotheses

As mentioned in above, our experiment aims to test the three hypotheses that:

1. subjects do not perform well in the inflation task, and less accurate perceptions and expectations of inflation correlate to a lower performance in the task and, thus, less adaptability to inflation,
2. heterogeneity of behavior in the experimental task can be explained by differences in individual characteristics, and
3. subjects are capable of improving their behavior through learning and a financial-education intervention.

In the following section, we analyze the results.

3. Results

3.1. Descriptive statistics: Subjects

104 subjects complete the entire experiment with comprehensive data (51 females and 53 males). They are 34.7 years old on average, ranging from 18 to 60. For 67 subjects, their highest degree is a master's; for 21, a bachelor's degree; for 13, high school diploma; and for three, a PhD. 86 subjects are employed, and the monthly median income is €2032. 88 subjects report being able to save money each month, with a median monthly savings of €600. 23 subjects report having taken out debt other than a mortgage in the past 12 months. Finally, we note that the median savings rate is 22%, which is roughly in-line with the average household savings rate in France since 2020 (*Taux d'épargne Des Ménages En 2022: Données Annuelles de 1950 à 2022,* 2023). We use the median, rather than mean, for income and savings since we had some anomalous outlier responses.

3.2. Overall performance

Table 1 displays the final savings across all four Savings Game sessions and the final remunerations paid to the 104 subjects. On average, subjects achieve an average of ₹5,933.48 (€7.91) in total final savings for the four Savings Game rounds and an average final total remuneration of ₹18,757.50 (€25.01), 45% and 55% of the maximum respectively.

Table 1 - Total remuneration and overall Savings Game performance

	Mean	Standard deviation	Minimum	50%	Maximum
Final remuneration (€)	25.01	3.97	14.66	25.17	37.21
Total final savings, 4 sessions (₮)	5933.48	2076.92	181.47	6269.54	11363.21

3.3. Behavior in the Savings Game

The evolution of subjects' average stock of goods and savings amount during the two inflation sequences (4x30 and 10x12) is presented in Figure 7. On average, during the first two Savings Game rounds, subjects exhibit behavior that deviates significantly from the best strategy, performing slightly better than the naïve strategy of buying one unit per period and not stocking any goods. Their average total final savings over the two sessions amount to 41.6% of the maximum achievable savings in contrast to 38.8% for the naïve strategy. We immediately observe significant over-stocking (i.e. amassing stocking during phases of positive real interest rate) in the early phases and wasteful-stocking (i.e. purchasing more units of the good than necessary to survive the 120 periods) at the end compared to the best strategy. As described below, we can decompose and quantify these behaviors further.

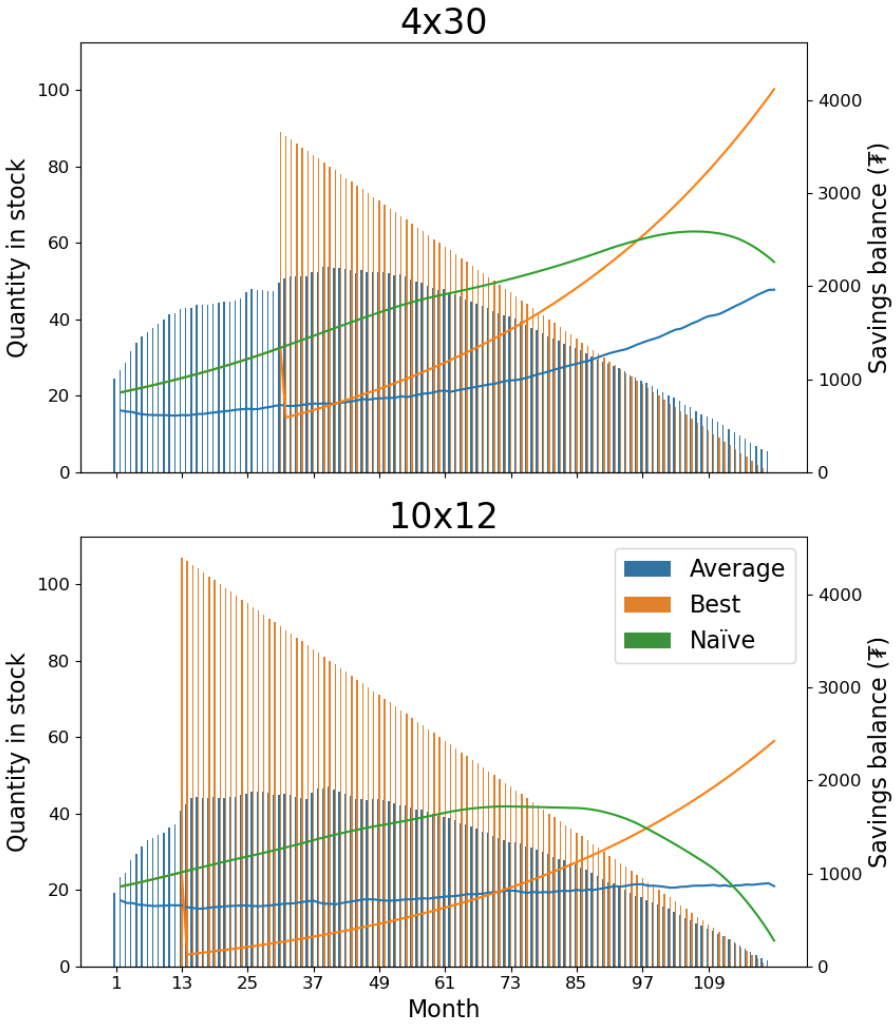

Figure 7 - Average stock of goods (vertical bars) and balance in savings account (lines) per period for subjects, for the best strategy, and for the naïve strategy for the first 4x30 and 10x12 inflation sequences

3.3.1. Performance and adaptation to changing inflation phases

Table 2 shows the average performance measures for both inflation sequences during the first two sessions. It should be noted that under-stocking as a performance measure is not entirely independent. Rather, the opportunity cost varies with the stock on-hand at the onset of a high-inflation phase. Indeed, the larger this stock, the less potential under-stocking opportunity cost the subject can incur. In other words, by definition, there is a negative correlation between over- and under-stocking costs. As a result, our analyses focus primarily on final savings and wasteful- and over-stocking opportunity costs as performance measures. Nevertheless, under-stocking is noteworthy conceptually since it reflects a failure to recognize a loss in purchasing power.

The opportunity costs associated with wasteful- and over-stocking explain much of the overall underperformance compared to the maximum savings via the best strategy. Over the two

rounds, the over- and wasteful-stocking opportunity costs amount to the equivalents of 26.3% and 7.0% of the maximum possible savings respectively. In other words, subjects lost over a quarter of the maximum achievable savings to over-stocking opportunity costs.

The remaining opportunity cost arises from under-stocking, purchases made too late during periods of high inflation. At the onset of the first high-inflation phase (periods $t = 13$ and $t = 31$ for 10x12 and 4x30 respectively), the best strategy is to stock up the number of units necessary to survive until the end of the game. As seen in Figure 7, however, at the onset of the first high-inflation phase, the average stock increases but not sufficiently. Subjects insufficiently adapt to the change in the inflation phase.

We measure subjects' adaptation to changes in the inflation phase by calculating the difference between the quantity purchased on average in the first 3 periods of high inflation and that purchased in the last 3 periods of the preceding low-inflation phase. On average the purchase adaptation amounts to 1.38 and 1.29 units of goods for inflation sequences 4x30 and 10x12 respectively. In comparison, the best strategy requires purchase adaptations of 29 and 35 units in 4x30 and 10x12 respectively.

Further, comparing the two sequences in Table 2, we observe that subjects perform better overall in 4x30 than 10x12, achieving 48% of the maximum and 36% respectively. Indeed, this is not surprising since 10x12 presents a more difficult sequence since high inflation occurs earlier and more often, requiring subjects to adapt earlier and more often as well.

Subjects demonstrate a greater over-stocking loss in 4x30 than 10x12. In 4x30, subjects should buy one unit per period through period 30 and stock up at period 31, while for 10x12, they must buy one unit per period through period 12 and then stock up at period 13. As a result, the under-stocking loss is greater for 10x12 as shown in Table 2.

Finally, on average, the purchase adaptation amounts to 1.38 units in 4x30 ($p \leq 0.01$), a correct, yet nevertheless insufficient, increase in consumption (between periods $28 \leq t \leq 30$ and $31 \leq t \leq 33$). There is also an increase in consumption at $91 \leq t \leq 93$ ($p \leq 0.01$); although, in absolute magnitude, this adaptation is small given the relatively few remaining units required to survive through $t = 120$. In 10x12, the consumption change following the first increase in inflation (between periods $10 \leq t \leq 12$ and $13 \leq t \leq 15$) is positive but not significant. That said, the subsequent adaptation of 1.21 units at the second increase in inflation at $37 \leq t \leq 39$ is positive and statistically significant ($p \leq 0.01$). See Appendix A Table 1 in Appendix A.1. Additional results.

Nevertheless, there are clear correlations ($p \leq 0.01$) between the performance measures across both inflation sequences. See Appendix A Table 2 in Appendix A.1. Additional results. Purchase adaptation, and under- and wasteful-stocking cost measures correlate positively and significantly ($p \leq 0.01$) across sequences, suggesting that subjects demonstrate consistency in their mistakes across sequences.

Table 2 - Difference between performance measures of 4x30 and 10x12 sequences

	Final savings (%)	Wasteful-stock (%)	Over-stock (%)	Under-stock (%)	Purchase adaptation
4x30 mean	47.66	8.45	30.83	13.06	1.38
(std)	(20.99)	(17.15)	(23.52)	(13.16)	(4.13)
10x12 mean	35.56	5.51	21.83	37.10	1.29
(std)	(20.88)	(11.58)	(16.97)	(27.66)	(4.36)
Difference mean	12.10***	2.94*	9.00***	-24.04***	0.09
(std)	(27.18)	(14.83)	(28.45)	(25.91)	(5.32)
Total	41.61	6.98	26.33	25.08	1.33
(std)	(21.75)	(14.67)	(20.95)	(24.74)	(4.24)

Finally, we observe a strong heterogeneity in terms of performance in terms of the four measures of interest: total final savings, over- and wasteful-stocking costs, and purchase adaptation, as can be seen in Figure 8.

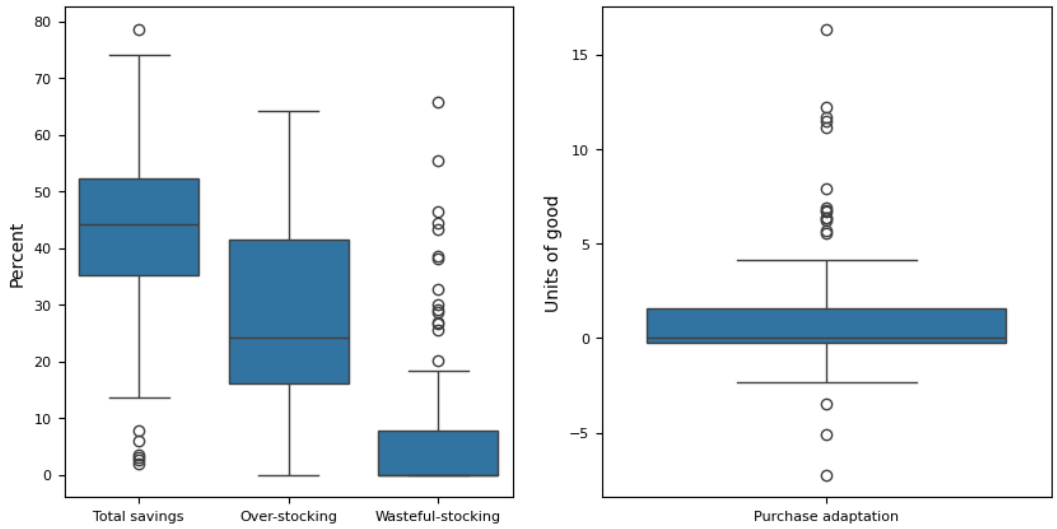

Figure 8 - Distribution of performance measures

3.3.2. Anticipation and perception of changing inflation phases

As shown in Figure 9, subjects have a reasonably good perception of inflation changes in both inflation sequences on average the first time they experience them. However, they tend to overestimate inflation on average when it is low, which is similar to patterns observed in macroeconomic data (Abildgren & Kuchler, 2021) and underestimate it when it is high,

consistent with experimental results from Georganas et al. (2014) and exponential growth bias (Levy & Tasoff, 2016; Stango & Zinman, 2008). Being the case, subjects appear to not expect much disinflation generally.

Additionally, as seen in Figure 10, there are positive correlations between perceived and expected inflation, which is in-line with macroeconomic data on perceived and expected inflation in France as of 2022 (Bignon & Gautier, 2022). This is especially noteworthy for 10x12 since the correct correlation should be negative—when inflation is high, a subject should expect it to decrease. These results suggest that subjects form adaptive expectation, rather than the rational expectations normally assumed in the literature (Rocheteau, 2023).

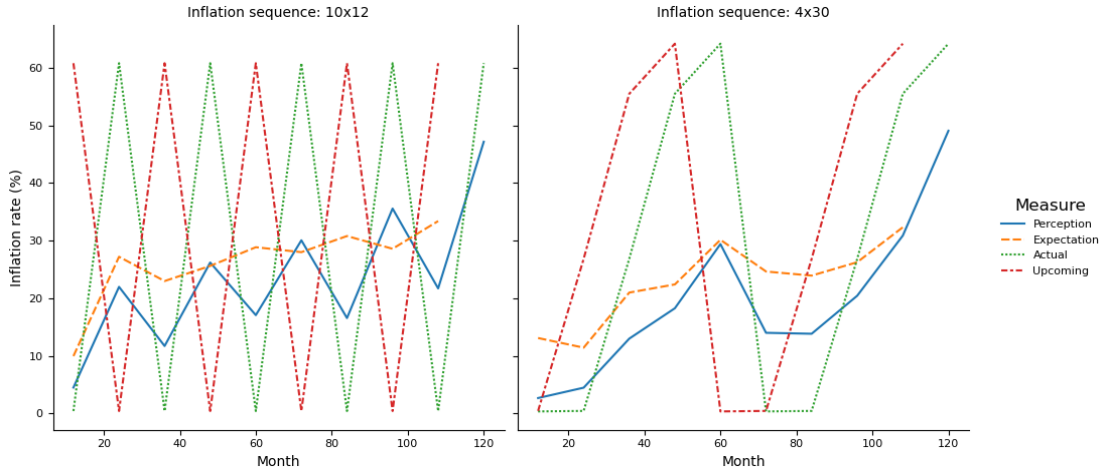

Figure 9 - Average inflation perception and expectation by sequence

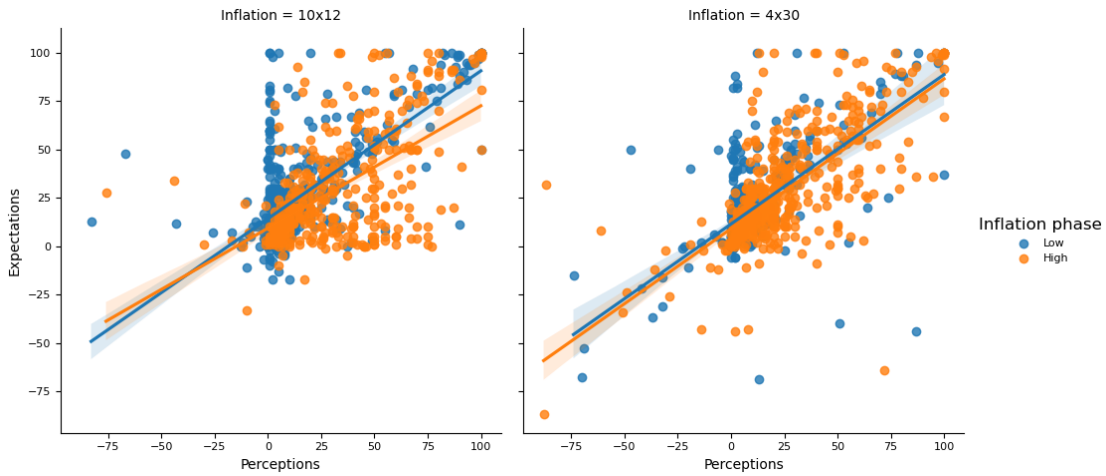

Figure 10 - Correlation between perceived and expected inflation

Table 3 shows the biases and sensitivities of perceived and expected inflation for each sequence. Subjects overestimate perception biases in low inflation (negative values) and

underestimate in high inflation. Expectation biases in 4x30 tend to produce overestimations in low inflation and underestimations in high inflation, whereas in 10x12, subjects over-anticipate in high inflation (when inflation will soon decrease) and under-anticipate in low inflation (when inflation will soon increase). Perception sensitivities are positive for both sequences; however, expectations sensitivity is only positive for 4x30 and, nonetheless, close to zero for both sequences. Being the case, perceiving inflation is generally easier for subjects than anticipating it, considering the only information they receive is the price of the good and, in the instructions, that prices can increase but not decrease.

The results in Table 3 and Figure 10 for low-inflation phases of the two inflation sequences in rounds 1 and 2 are generally in-line with trends in real-life macroeconomic data from the European Union and France, where households' perceptions and expectations overestimate inflation (Abildgren & Kuchler, 2021; Gautier & Montornès, 2022). This macroeconomic data is primarily comparable to the low inflation phases in the Savings Game, considering the "high" in-task inflation is more than five times higher than the highest rate reached over the past 30 years in France as well as the on average within the European Union. Further, the positive correlation between perceptions and expectations is also similar to trends observed in macroeconomic data (Bignon & Gautier, 2022).

Table 4 shows the correlations between these measures across the two inflation sequences, allowing us to evaluate the consistency of subjects' biases and sensitivities across sequences as well. We see that expectations and perception biases show positive correlations ($p \leq 0.01$) between 10x12 and 4x30. Perception sensitivity also demonstrates positive correlations ($p \leq 0.01$) between sequences, but expectation sensitivity does not. This makes sense given the negative sensitivity subjects have in 10x12.

Table 3 - Perceived and expected inflation bias and sensitivity

	Expectation bias (High inflation)	**Expectation bias (Low inflation)**	**Expectation sensitivity**	**Perception bias (High inflation)**	**Perception bias (Low inflation)**	**Perception sensitivity**
4x30 mean	21.51	-4.63	0.12	21.99	-8.34	0.59
(std)	(22.62)	(19.86)	(0.31)	(20.47)	(13.85)	(0.29)
10x12 mean	-26.91	35.58	-0.09	28.59	-13.88	0.45
(std)	(23.59)	(21.05)	(0.38)	(22.00)	(18.85)	(0.34)
Difference mean	48.42***	-40.21***	0.21***	-6.6***	5.53***	0.14***
(std)	(20.91)	(20.31)	(0.53)	(20.05)	(17.99)	(0.29)
Total	21.51	-4.63	0.12	21.99	-8.34	0.59
	(22.62)	(19.86)	(0.31)	(20.47)	(13.85)	(0.29)

Table 4 - Correlations in biases and sensitivities across inflation sequences

	Expectation bias (10x12)	Expectation bias (4x30)	Expectation sensitivity (10x12)	Expectation sensitivity (4x30)	Perception bias (10x12)	Perception bias (4x30)	Perception sensitivity (10x12)	Perception sensitivity (4x30)
Expectation bias (10x12)	—							
Expectation bias (4x30)	0.6***	—						
Expectation sensitivity (10x12)	-0.09	-0.05	—					
Expectation sensitivity (4x30)	0.01	-0.07	-0.15	—				
Perception bias (10x12)	0.86***	0.48***	-0.1	0.05	—			
Perception bias (4x30)	0.44***	0.8***	-0.08	0.01	0.5***	—		
Perception sensitivity (10x12)	-0.22**	-0.08	-0.02	-0.09	-0.1	0.05	—	
Perception sensitivity (4x30)	-0.02	0.06	0.06	0.11	0.05	0.1	0.58***	—

3.3.3. Quality of inflation expectations and perceptions and performance

Table 5 exhibits correlations between inflation perceptions and expectations along with performance measures. Expected inflation sensitivity correlates positively and negatively by 0.208 ($p \leq 0.01$) and 0.344 ($p \leq 0.01$) with expectation biases in low- and high-inflation phases respectively. Perceived and expected inflation sensitivities also correlate positively with final savings by 0.201 ($p \leq 0.01$) and 0.139 ($p \leq 0.01$) respectively. Perception sensitivity correlates positively, albeit weakly, with purchase adaptation by 0.067 ($p \leq 0.01$); however, there is no statistically significant correlation between expectation sensitivity and consumption change. This suggests that subjects who perceive and/or anticipate inflation more accurately perform better in the Savings Game.

These results, therefore, support Hypothesis 1 that subjects do not perform well in the inflation task and that less accurate perceptions and expectations of inflation correlate to a lower performance in the task and, thus, less adaptability to inflation.

We also note that perception bias in low-inflation phases correlates negatively with performance ($p \leq 0.01$), meaning that overestimating inflation correlates with lower performance. Conversely, expectation bias in low-inflation phases correlates positively with performance ($p \leq 0.01$), meaning that performance improves with a tendency to over-anticipate inflation in low inflation. In high-inflation phase, though, expectation bias correlates

negatively with performance ($p \leq 0.01$), meaning that performance improves with a tendency to under- rather than over-anticipate inflation. These correlations make sense, considering that performance relies on subjects' abilities to anticipate and perceive the changes between low- and high-inflation phases.

Table 5 - Correlations between biases, sensitivities, and task performance measures

	Perception sensitivity	Perception bias (Low inflation)	Perception bias (High inflation)	Expectation sensitivity	Expectation bias (Low inflation)	Expectation bias (High inflation)	Purchase adaptation	Final savings
Perception sensitivity	—							
Perception bias (Low inflation)	-0.455***	—						
Perception bias (High inflation)	0.275***	0.582***	—					
Expectation sensitivity	0.065***	-0.172***	0.024	—				
Expectation bias (Low inflation)	0.025	0.432***	0.596***	0.208***	—			
Expectation bias (High inflation)	-0.23***	0.621***	0.416***	-0.344***	-0.05***	—		
Purchase adaptation	0.067***	0.099***	0.136***	0.025	0.071***	0.064***	—	
Final savings	0.201***	-0.151***	0.027	0.139***	0.106***	-0.257***	0.051***	—

3.3.4. Real life vs. Savings Game

In our inflation awareness questionnaire, when assessing subjects' responses to how they would adjust behavior if prices increased in the ensuing 12 periods, we observe a lack of adaptation to inflation in the answers. Most individuals do not expect to change their behavior at the time of the experiment (see Appendix A Table 4 and Appendix A Table 5 in Appendix A.1. Additional results). Given that the experiment takes place during still an early phase of inflation in real life in France, however, we are not surprised to see that subjects do not demonstrate adaptability to inflation in real life.

We observe no correlation between individual answers in real life and performance measures. This is also not surprising given subjects' inconsistent answers in the questionnaire.

Nevertheless, as per Table 6, there are noteworthy correlations between inflation perceptions and expectations biases in real life and the Savings Game. Firstly, subjects show consistency in the correlations between their perception and expectation biases. Real life expectation biases

correlate positively by 0.57 and 0.85 ($p \leq 0.01$) to real life perception bias.[3] Savings Game-based expectation biases similarly correlate positively by 0.74 and 0.76 ($p \leq 0.01$) for low and high inflation phases respectively. Secondly, we observe positive correlations ($p \leq 0.01$) between real life and Savings Game biases, of both perceptions and expectations. The correlation is especially strong between low-inflation perception biases in the Savings Game and real-life perception biases, which makes sense considering they relate to similar inflationary conditions; high inflation in the Savings Game is a magnitude of order higher than the "high" inflation experienced in France at the time of the experiment. This suggests that the Savings Game has external validity, successfully eliciting similar perception and expectation tendencies from subjects to those they demonstrate in real life. See Appendix A Table 6 in Appendix A.1. Additional results for subjects' reported perceived and expected inflation in real life.

Table 6 - Correlations between in-task and real-life expected and perceived inflation measures

	Real life, Highest inflation	Real life, Lowest inflation	Real life, Last 12 months	Real life, Current inflation	Real life, Next 12 periods	In-task, Expectation bias, Low	In-task, Expectation bias, High	In-task, Perception bias, Low	In-task, Perception bias, High
Real life, Highest inflation	—								
Real life, Lowest inflation	0.21*	—							
Real life, Last 12 months	0.55***	0.24*	—						
Real life, Current inflation	0.64***	0.24*	0.79***	—					
Real life, Next 12 periods	0.39***	0.09	0.85***	0.57***	—				
In-task, Expectation bias, Low	0.2*	-0.11	0.34***	0.3**	0.35***	—			
In-task, Expectation bias, High	0.22*	-0.04	0.35***	0.33***	0.34***	0.86***	—		
In-task, Perception bias, Low	0.29**	0.04	0.51***	0.49***	0.49***	0.74***	0.72***	—	
In-task, Perception bias, High	0.13	-0.0	0.33***	0.35***	0.25*	0.67***	0.76***	0.6***	—

3.3.5. Regression of initial performance

To further analyze the relationship between subjects' initial performance for each inflation sequence (i.e. the first two sessions) and the relation to the inflation measures, we conduct an

[3] We correlate to perceptions as both subjects' estimates of the "current" inflation rate as well as the rate over the "last 12 months," which should be equal.

ordinary least squares regression (OLS) to understand the ratios of total final savings, over-stocking, and wasteful-stock to the maximum savings via the best strategy. Table 7 shows the results.

Firstly, in terms of overall ("total") performance, we find further confirmation that the 10x12 sequence is more difficult, whereby performance is lower by over 17% of the maximum savings ($p \leq 0.01$). We also see that facing 10x12 in the second session as opposed to the first is beneficial, leading to a higher final savings by an additional 17% of the maximum savings ($p \leq 0.01$). The 10x12 sequence also relates negatively to over-stocking ($p < 0.1$), which makes sense since there is a smaller window to over-stock initially. But, over-stocking increases in the second session by 19% of maximum savings ($p \leq 0.01$), indicating that subjects are pessimistic about inflation after having experienced the first session. Furthermore, perception sensitivity relates positively to overall performance ($p \leq 0.01$) and negatively to both over- ($p \leq 0.1$) and wasteful-stocking ($p \leq 0.01$) costs, which further validates the importance of an accurate understanding of inflation for success in the Savings Game.

Table 7 - OLS regressions of performance measures in first two sessions

Variables	**(1)** **Final savings (%)**	**(2)** **Over-stock (%)**	**(3)** **Wasteful-stock (%)**
Intercept	0.4073***	0.2681***	0.1760***
	(0.0404)	(0.0376)	(0.0285)
Inflation, 10x12	-0.1731***	-0.0652*	-0.0476
	(0.0414)	(0.0385)	(0.0291)
Day 2	-0.0644	0.1898***	-0.0437
	(0.0405)	(0.0376)	(0.0285)
Inflation, 10x12 × Day 2	0.1681***	-0.0751	0.0009
	(0.0575)	(0.0534)	(0.0405)
Expectation sensitivity	0.0255	-0.0618	0.0226
	(0.0408)	(0.0379)	(0.0287)
Expectation bias	0.0008	0.0001	0.0002
	(0.0009)	(0.0008)	(0.0006)
Perception sensitivity	0.1726***	-0.0820*	-0.1145***
	(0.0458)	(0.0425)	(0.0322)
Perception bias	-0.0004	0.0003	-0.0001
	(0.0005)	(0.0005)	(0.0004)
R-squared	0.1673	0.2215	0.0945
R-squared Adj.	0.1380	0.1941	0.0626

Standard errors in parentheses.

* p<.1, ** p<.05, *** p<.01

3.4. The role of individual preferences, knowledge, cognitive flexibility and inconsistent choice behavior

3.4.1. Correlations with individual characteristics

We now assess Hypothesis 2, that heterogeneity of behavior in the Savings Game can be explained by differences in individual characteristics. To this end, we examine the relationship between subjects' responses to the battery of additional tests and their performance in the Savings Game.

From the three knowledge measures, we find that 58% of subjects are financially literate, 24% are numerate, and 51% are compound interest-capable.

We elicit subjects' seven preferences via the tests described in Section 2.3.3. Appendix A Table 3 in Appendix A.1. Additional results shows the mean and standard deviation for each preference task. As mentioned previously, for risk aversion, loss aversion, and time preferences, we include a measure that counts the number of "switches" a subject makes, where more than one switch for a given series of choices suggests a subject has inconsistent preferences (Kurtz-David et al., 2019). Note that for time preferences, consistent choice behavior results in three switches since there are three choice sets.

We correlate these individual characteristics and preferences with the four performance measures as well as the in-task inflation measures. Further, we apply a Bonferroni correction to account for the interdependence between the performance measures (i.e. an increase in over-stocking cost by definition reduces final savings). The results in the tables below exhibit only the statistically significant correlations with p values below the Bonferroni-corrected threshold.

For knowledge measures in Table 8, we find positive correlations between final savings and all three knowledge measures ($p \leq 0.01$). We also find a positive correlation between numeracy and purchase adaptation ($p \leq 0.01$).

Table 8 -Correlations between knowledge and performance measures (with Bonferroni correction)

Characteristic	Performance measure	Correlation	p value
Financially literate	Final savings (%)	0.2870	0.0031
Numerate	Final savings (%)	0.2711	0.0054
Compound interest-capable	Final savings (%)	0.2929	0.0025
Numerate	Purchase adaptation	0.2632	0.0070

We find no statistically significant correlations between neither the adaptability measures (i.e. Wisconsin card sorting task) nor the four economic preferences and any of the performance measures. However, in Table 9, we see negative correlations between the number of time preference- and risk-related switches and final savings. We also find positive correlations between the inconsistency of economic decisions and wasteful-stock costs. These results are intuitive, considering that wasteful-stock costs are the most incoherent mistake from the perspective of economically rational decision-making within the task, particularly considering that they do not relate to inflation.

Table 9 - Correlations between inconsistencies in economic preferences and performance measures (with Bonferroni correction)

Characteristic	Performance measure	Correlation	p value
Loss aversion, number of switches	Wasteful-stock cost (%)	0.3034	0.0017
Risk aversion, number of switches	Final savings (%)	-0.2754	0.0047
Risk aversion, number of switches	Wasteful-stock cost (%)	0.3451	0.0003
Time preferences, number of switches	Final savings (%)	-0.3675	0.0001
Time preferences, number of switches	Wasteful-stock cost (%)	0.3284	0.0007

Correlating the inflation bias and sensitivity with knowledge measures in Table 10, we observe positive correlations between numeracy and compound interest-capability with perception sensitivity ($p \leq 0.01$). We also find a positive correlation between compound interest-capability and perception bias ($p \leq 0.01$). These results suggest that numerical abilities do indeed correlate with individuals' perceptions of inflation.

Table 10 - Correlations between knowledge and inflation bias and sensitivity measures (with Bonferroni correction)

Characteristic	Performance measure	Correlation	p value
Numerate	Perception sensitivity	0.3684	0.0001
Compound interest-capable	Perception sensitivity	0.4140	0.0000
Compound interest-capable	Perception bias	0.3181	0.0010

Once again, we find no correlation between the economic preferences and inflation measures. In Table 11, we do, however, find a negative correlation between the number of risk-related switches and perception sensitivity ($p \leq 0.01$) and positive correlation between risk-related switches and expectation bias ($p \leq 0.01$). The correlation between perception sensitivity. We also find a positive correlation between adaptability as measured by the WCST and perception sensitivity ($p \leq 0.01$). The correlations with the number of switches suggest a connection between inconsistency of economic decisions and less precise perceptions and expectations,

while adaptability appears to relate positively to individuals' abilities to perceive the changes in inflation.

Table 11 - Correlations between inconsistency and inflation bias and sensitivity measures (with Bonferroni correction)

Characteristic measure	Performance measure	Correlation	p value
Risk aversion, number of switches	Perception sensitivity	-0.3472	0.0003
Risk aversion, number of switches	Expectation bias	0.3161	0.0011
Wisconsin card sorting task, number correct	Perception sensitivity	0.2793	0.0041

3.4.2. Regression on individual characteristics

Next, we conduct an OLS regression of the performance measures on the individual characteristics, using a forward selection algorithm that maximizes the adjusted R^2 of each model (Lindsey & Sheather, 2010). Table 12 shows the results of regressions for final savings, over-stocking, and wasteful-stock relative to the maximum. Only algorithm-selected variables appear. We find that expectation sensitivity relates positively to final savings ($p \leq 0.1$), and overall inconsistency in economic decisions (i.e. total switches) relates negatively ($p \leq 0.01$). The procedure further produces a model for over-stocking with a negative relationship between numeracy ($p \leq 0.1$) and over-stocking but positive between financial literacy and over-stocking ($p \leq 0.05$). Finally, for wasteful-stocking, we find a positive relationship with the inconsistency of economic preferences ($p \leq 0.01$) and, interestingly, with age ($p \leq 0.01$); although, the relationship with age is weak.

Admittedly, this is a heuristic method to see which of the many variables measuring different individual characteristics. Nevertheless, it is interesting to see in the resulting regression models that expectation sensitivity, financial literacy, numeracy, and inconsistency of economic preferences demonstrate strong influence. Of particular note, the positive relationship between financial literacy and over-stocking, while initially counterintuitive, may demonstrate how financially literate subjects were concerned primarily with economizing—avoiding higher prices in the future—but were overly pessimistic about and/or actually overestimated inflation.

Overall, these correlations and regression provide support for Hypothesis 2, that heterogeneity of behavior in the experimental task (i.e. performance) can be explained by differences in individual characteristics. More specifically, the most relevant characteristics include numerical abilities (i.e. numeracy and compound-interest capability), financial literacy, and consistency of economic decisions.

Table 12 - Forward-selected OLS regressions of performance measures from first two sessions

Variables	(1) Final savings (%)	(2) Over-stock (%)	(3) Wasteful-stock (%)
Intercept	0.6550***	0.4645***	-0.2101***
	(0.0662)	(0.1014)	(0.0545)
Compound	0.0518		
	(0.0320)		
Financially literate		0.0706**	
		(0.0342)	
Numerate	0.0321	-0.0782*	
	(0.0373)	(0.0401)	
Age		-0.0024	0.0034***
		(0.0017)	(0.0012)
Education level		-0.0293	
		(0.0231)	
Expectation sensitivity, pre-treatment	0.1039*	-0.1076	
	(0.0625)	(0.0701)	
Monthly income	-0.0000		
	(0.0000)		
Can save			-0.0339
			(0.0312)
Total switches	-0.0275***		0.0300***
	(0.0065)		(0.0051)
Risk aversion, safe choices	-0.0095		
	(0.0066)		
Time preferences, smaller-sooner choices	-0.0033		0.0025
	(0.0022)		(0.0018)
WCST, number correct		-0.0033	
		(0.0024)	
R-squared	0.3396	0.1257	0.3320
R-squared Adj.	0.2915	0.0716	0.3051

Standard errors in parentheses.

* p<.1, ** p<.05, *** p<.01

3.5. Learning and Intervention

3.5.1. Differences in performance change

We now investigate support for Hypothesis 3, that subjects are capable of improving their behavior through learning and a financial-education intervention. First, we assess a potential learning effect then potential treatment effect between sessions through difference-in-difference measures. Specifically, we take the mean difference in change for each measure (final savings, over- and wasteful-stocking costs, and consumption change) between the first two and second two sessions. For the intervention, we calculate the difference-in-difference between the treatment and control group.

Across all subjects, we find a 9% overall increase in performance relative to the maximum ($p \leq 0.05$) and 4% decrease in wasteful-stocking costs relative to the maximum ($p \leq 0.01$). We also observe an increase in expectation sensitivity ($p \leq 0.05$), suggesting that subjects learn to anticipate the price increases over the four sessions. Taken together, we conclude that there is a learning effect over the course of the experiment.

Table 13 - Change in performance between first and second two sessions

	Final savings (%)	Over-stock (%)	Wasteful-stock (%)	Purchase adaptation	Perception sensitivity	Perception bias	Expectation sensitivity	Expectation bias
Mean difference	0.09**	0.06	-0.04***	0.32	0.03	-1.2	0.08**	-1.44
(std)	(0.37)	(0.39)	(0.2)	(5.71)	(0.23)	(23.43)	(0.32)	(16.26)

Being the case, though, as Table 14 shows, we do not find any statistically significant difference in the change in performance between the intervention and control groups.

Table 14 - Change in performance among treatment groups

	Final savings (%)	Over-stock (%)	Wasteful-stock (%)	Purchase adaptation	Perception sensitivity	Perception bias	Expectation sensitivity	Expectation bias
Mean (control)	0.07	0.07	-0.03	0.13	0.11	1.04	0.02	-1.35
Mean (intervention)	0.11	0.04	-0.05	0.52	0.05	-3.92	0.05	-1.05
Mean difference	0.04	-0.03	-0.02	0.39	-0.06	-4.96	0.03	0.3

Investigating further, we analyze the intervention's impact per individuals' knowledge and economic preferences to see if there is a heterogeneous impact according to particular characteristics.

While we find no statistically significant difference in impact from the financial education intervention on financially literate and illiterate subjects, we do find the intervention has an impact on numerate subjects ($p \leq 0.05$), who reduce their over-stocking cost compared to the innumerate (Table 15). Similarly, we find the intervention has an impact on compound interest-capable subjects ($p \leq 0.01$), helping reduce both their early costs and perception bias (Table 16).

Furthermore, we observe improvement amongst more adaptive subjects (identified by a median split of the number of correct selections in the Wisconsin card sorting task) receiving the intervention as compared to their less adaptive counterparts in total performance (Table 17).

Overall, these findings suggest that the intervention only produced impact for the subjects identified as the most numerically capable and behaviorally adaptive. Both such findings make sense. More numerically capable subjects are better equipped to not only better perceive the change in inflation through prices alone, but also concretely understand the value of saving during periods of positive real interest as opposed to over-stocking. Further, adaptive subjects may simply be more inclined to adopt novel practices.

Table 15 - Difference between numerate and innumerate with intervention

	Final savings (%)	Over-stock (%)	Wasteful-stock (%)	Purchase adaptation	Perception sensitivity	Perception bias	Expectation sensitivity	Expectation bias
Mean (not numerate)	0.13	0.14	-0.05	0.75	0.07	1.11	0.03	-5.42
Mean (numerate)	0.08	-0.17	-0.03	0.05	0.00	-5.50	0.08	-0.84
Mean difference	-0.05	-0.31**	0.03	-0.70	-0.07	-6.61	0.05	4.58

Table 16 - Difference between compound interest capable and compound interest incapable with intervention

	Final savings (%)	Over-stock (%)	Wasteful-stock (%)	Purchase adaptation	Perception sensitivity	Perception bias	Expectation sensitivity	Expectation bias
Mean (incapable)	0.09	0.24	-0.03	0.80	0.05	11.90	0.01	-1.80
Mean (capable)	0.14	-0.14	-0.06	0.27	0.05	-13.04	0.08	-5.89
Mean difference	0.05	-0.38***	-0.02	-0.53	0.00	-24.94***	0.07	-4.09

Table 17 - Difference between more adaptive and less adaptive with intervention

	Final savings (%)	Over-stock (%)	Wasteful-stock (%)	Purchase adaptation	Perception sensitivity	Perception bias	Expectation sensitivity	Expectation bias
Mean (below median)	0.03	0.08	-0.01	-0.65	0.01	-3.23	0.08	-6.08
Mean (above median)	0.20	0.00	-0.08	1.70	0.09	-4.61	0.01	3.98
Mean difference	0.17**	-0.08	-0.08	2.35	0.08	-1.38	-0.07	10.06

3.5.2. Regression of performance on intervention

We repeat the OLS regressions on performance measures now with the intervention to assess the treatment's impact. Appendix A Table 7 in Appendix A.1. Additional results shows the results. As can be seen, the intervention does not demonstrate improvement. We also note that session 2 and 4 both produce high over-stocking ($p \leq 0.01$, $p \leq 0.05$), which may imply that the pessimism about inflation subjects gain after session 1 is reinforced after session 3. More

interestingly, though, the results reiterate the importance of subjects' inflation beliefs, where perception sensitivity continues to be a strong indicator of good performance ($p \leq 0.01$).

Next, we repeat the forward selection algorithm with the intervention as an additional variable. Appendix A Table 8 in Appendix A.1. Additional results shows the models the algorithm produces. The intervention variable does not demonstrate statistically significant impact, as expected per the overall difference in performance change between treatment groups from Table 14. That said, we find a positive interaction term with adaptability per the WCST ($p \leq 0.05$) for final savings; however, the interaction terms of numeracy and compound interest are not selected by the algorithm. At the very least, this seems consistent with the overall unconvincing impact from the intervention.

4. Discussion

Below, we assess our initial hypotheses as well as additional advances that our experiment demonstrates and further research questions that arise from our results.

4.1. Hypotheses

The present experiment aims to test the hypotheses that:

1. subjects do not perform well in the inflation task, and less accurate perceptions and expectations of inflation correlate to a lower performance in the task and, thus, less adaptability to inflation,
2. heterogeneity of behavior in the experimental task can be explained by differences in individual characteristics, and
3. subjects are capable of improving their behavior through learning and a financial-education intervention.

Considering the results above, we confirm Hypothesis 1. Subjects perform well below the maximum benchmark, especially in the 10x12 sequence, which proves to be more difficult. Furthermore, not only do we find consistent correlations between subjects' perceptions and expectations of inflation and their overall performance as well as purchase adaptation, but these inflation measures demonstrate relatively strong predictive power in our regressions of performance as well.

Regarding Hypothesis 2, having measured a number of individual characteristics, there are a few that appear to consistently relate to performance. Numeracy and compound-interest capability demonstrate clear positive correlations across a number of measures as well as

demonstrate relatively important roles in the regression models. Conversely, subjects' inconsistency of economic decisions clearly correlates with worse performance across the measures as well as plays a negative role in the regression models. These characteristics make intuitive sense. Ultimately, the Savings Game requires numerical information processing. The only information subjects have to deduce inflation is that of prices, and they need to consider opportunity costs for each savings-purchase decision. Being the case, those with more switches in the economic preference tasks demonstrate less consistency in economic decision-making as a whole, which also naturally risks lowering performance.

Finally, for Hypothesis 3, although we do confirm a learning effect over the course of the four sessions, we do not find an overall impact from the intervention.

4.2. General analysis

Beyond confirming our first two hypotheses and partially confirming the third, the results of our experiment provide validation of our research approach and experimental procedure, allowing us to address additional challenges that the literature on inflation and behavior has faced.

First of all, our experiment demonstrates that it is logistically possible to conduct multi-day experiments online. At the end of the four days, we have an 88% completion rate among subjects, meaning only 12% did not complete the full, four-session procedure. This validation of the multi-day procedure offers new possibilities for studying behavior online over time, a more cost-effective and scalable method than in-person laboratory experimentation methods.

Second, there exists a valid debate as to how much of the heterogeneity between households' inflation perceptions and expectations is due to differences in their perceptions and/or expectations as opposed to differences in the actual, personal inflation rate each household faces. This doubt arises since each household, in fact, purchases a unique basket of goods, which may not be accurately reflected in the headline inflation rate to which their perceptions and expectations are compared (Ranyard et al., 2008). By restricting the information on inflation in the Savings Game to simply the changes in price of a single good, we ensure that all subjects face exactly the same inflationary environment and information set. As a result, we are sure that the biases subjects exhibit as well as the heterogeneity of estimations between subjects are indeed the result of divergences from the actual inflation rate—and not merely reflections of differences in the true personal inflation rates each subject faces since we know there is a

significative heterogeneity across households. For instance, low-income, rural, and senior households were the most affected by recent inflation in OECD countries (Causa et al., 2022).

More generally, though, the Savings Game successfully distills into a controlled experimental environment the key components of the inflationary experience that household decision-makers face. By remunerating subjects for their final savings balance while conditioning success or failure on their consumption, we force them to explicitly face the trade-off between building and protecting wealth and economizing their purchases. As such, we can replicate and isolate the consumption-savings decisions that subjects make in real life when facing rising prices and directly link their behavior to their perceptions and expectations of inflation, which the existing literature has been unable to achieve.

Furthermore, comparing the experimentally elicited perceptions and expectations of inflation to subjects' real-life estimates, we observe similar biases and, indeed, strong correlations between the in-task and real-life. These findings suggest that the Savings Game does in fact provide external validity in capturing subjects' biases. This external validity also adds weight to the validity of the consumption and savings behaviors we measure in the task, particularly as they relate to inflation perceptions and expectations and the biases underlying them. Therefore, we can further confirm that we achieve our objective of providing the missing micro-level behavioral data required to better understand the relationship between perceptions and expectations of inflation and behavior at the individual level.

4.3. Further investigation

Our results highlight that perceptions and expectations do appear to play an important role in overall performance. Thus, it is noteworthy that subjects demonstrate such large biases in their perceptions and expectations. Two questions arise from this point. First, as Andrade et al. (2023) note, qualitative estimates (i.e. simply saying whether prices increased or decreased, rather than giving a point estimate) may offer better indicators. Second, our slider measurement method, while aiming to offer an unbiased tool, may be too cumbersome for subjects to provide precise estimates; that is to say that they do not take the time to drag the slider to the exact value of their estimate. Measuring qualitative estimates as well as improving the estimate elicitation method is, therefore, one area of improvement for the Savings Game.

An additional challenge arising from the performances in the experiment is explaining the high levels of over-stocking subjects demonstrate in the first periods. Because we only measure their inflation expectations after period $t = 12$, we cannot directly assess whether this early over-

stocking relates to their pessimism about, and thus high expectations of, inflation from the start. Therefore, an additional improvement that can be made would be to measure expectations at period $t = 1$ and compare them to over-stocking behavior to see if there is indeed a correlation.

The lack of impact by our intervention, a simple financial education, is ultimately consistent with much research in the field, which demonstrates the challenge financial education faces in improving decision-making (Lusardi, 2008; Mandell & Klein, 2009; Stolper & Walter, 2017). Reflecting on the method and information, two aspects become apparent in regards to offering an effective educational experience. First, subjects do not receive any information or feedback regarding their performance, particularly how poorly they may have performed compared to the maximum possible. As a result, they may not recognize just how much they diverge from the recommended strategy and, thus, believe that they already do what the intervention suggests or that they do not need to improve and so do not heed the advice offered. Indeed, as Georganas et al. (2014) observe, individuals rarely receive feedback on their savings-consumption decisions and, as a result, rarely feel the need to improve their decision-making habits. Therefore, providing clear feedback may be necessary to improving an intervention's efficacy.

Second, the explanation of the concepts and strategy may be too theoretical, not offering practical steps to take during the game. As a result, subjects may not understand the information or not be able to put the information into practical steps in the Savings Game. A more effective intervention might include not just feedback on subjects' performance but guidance to better understand where they make mistake, how those mistakes impact them, and a practical explanation of how to implement the recommended strategy.

Being the case, there are a number of clear steps forward to advance this research in inflation and behavior via experimental methods further.

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Appendix A.

Supplemental material

Appendix A.1. Additional results

Appendix A Table 1 - Purchase adaptation at each inflation phase-change

	Inflation sequence											
	4x30			10x12								
Period	**33**	**63**	**93**	**15**	**27**	**39**	**51**	**63**	**75**	**87**	**99**	**111**
Mean difference	1.38***	0.2	0.22*	1.36	0.09	1.21***	-0.11	0.08	0.36***	0.07	0.2***	-0.01
(std)	(4.13)	(1.86)	(1.17)	(7.38)	(3.44)	(4.56)	(2.83)	(1.06)	(1.55)	(1.53)	(1.02)	(0.92)

Appendix A Table 2 - Correlations between performance measures and inflation sequences

	Purchase adaptation 10x12	**Purchase adaptation 4x30**	**Over-stock (%) 10x12**	**Over-stock (%) 4x30**	**Wasteful-stock (%) 10x12**	**Wasteful-stock (%) 4x30**	**Under-stock (%) 10x12**	**Under-stock (%) 4x30**	**Final savings (%) 10x12**	**Final savings (%) 4x30**
Purchase adaptation 10x12	—									
Purchase adaptation 4x30	0.28***	—								
Over-stock (%) 10x12	-0.2**	-0.11	—							
Over-stock (%) 4x30	0.02	-0.3***	0.04	—						
Wasteful-stock (%) 10x12	-0.07	-0.16	-0.12	0.09	—					
Wasteful-stock (%) 4x30	-0.12	-0.06	0.02	-0.15	0.52***	—				
Under-stock (%) 10x12	-0.16	0.03	-0.71***	-0.21**	-0.06	-0.03	—			
Under-stock (%) 4x30	-0.06	0.01	-0.18*	-0.7***	-0.15	-0.06	0.37***	—		
Final savings (%) 10x12	0.41***	0.13	0.19*	0.2**	-0.37***	-0.27***	-0.72***	-0.25***	—	
Final savings (%) 4x30	0.11	0.37***	0.06	-0.56***	-0.43***	-0.61***	0.03	0.2**	0.16	—

Appendix A Table 3 - Results of economic preference tasks

	Mean	Standard Deviation
WCST, number correct	15.52	7.08
Risk aversion, safe choices	6.12	2.14
Risk aversion, number of switches (Correct number)	1.27 (1)	1.09
Loss aversion, coin tosses	2.15	1.36
Loss aversion, switches (Correct number)	1.09 (1)	0.67
BRET, total boxes collected	47.24	24.30
Time preferences, smaller-sooner choices	10.96	6.41
Time preferences, switches (Correct number)	3.23 (3)	1.44

Appendix A Table 4 - Responses to real-life inflation behavioral changes

	Increase (%)	No change (%)	Decrease (%)
Purchase of cheaper goods	64.90	31.73	3.37
Purchase of goods less impacted by inflated	53.37	45.19	1.44
Quantity purchased	8.17	52.40	39.42
Stock Maintained	26.92	46.15	26.92
Spending on leisure	4.33	32.69	62.98
Spending on subscriptions	4.81	48.56	46.63
Investment in insurance	12.50	71.15	16.35
Investment in real estate	13.94	69.71	16.35
Investment in Livret A	34.62	43.27	22.12
Investment in mutual funds	6.73	75.00	18.27
Investment in stocks	9.62	68.75	21.63
Investment in indexed bonds	10.10	68.75	21.15
Money held in checking account	11.06	59.62	29.33

Appendix A Table 5 - Responses to real-life inflation behavioral changes, yes-no

	Yes (%)	Maybe (%)	No (%)
Move to lower rent	9.62	25.00	65.38
Seek additional income	71.15	18.27	10.58
Seek a new job	29.33	18.75	51.92
Reduce energy consumption	35.58	25.48	38.94
Change mode of transportation	45.19	18.75	36.06

Appendix A Table 6 - Real-life perceived and expected inflation

	Mean (%)	Standard deviation	Minimum	50%	Maximum	*Headline inflation*
Highest inflation in last 30 years	17.04	17.54	-34.90	11.50	100.00	*6.30*
Lowest inflation in last 30 years	0.16	13.02	-85.30	0.60	95.60	*0.00*
Average perceived inflation for last 12 periods	13.46	14.31	-17.80	9.32	87.85	*6.00*[a]
Perceived current inflation	9.51	11.83	0.00	6.50	96.10	*6.00*[b]
Expected inflation for next 12 periods	14.07	16.38	0.00	9.25	98.20	*2.90*[c]

[a] February 2023
[b] February 2023
[c] February 2024

Appendix A Table 7 - OLS regression of performance on intervention and inflation measures

Variables	(1) Final savings (%)	(2) Over-stock (%)	(3) Wasteful-stock (%)
Intercept	0.4346***	0.3074***	0.1422***
	(0.0487)	(0.0488)	(0.0314)
Inflation, 10x12	-0.1843***	-0.0870	-0.0217
	(0.0599)	(0.0600)	(0.0386)
Day 2	-0.0930	0.1631***	0.0060
	(0.0593)	(0.0594)	(0.0382)
Day 3	-0.0226	0.0942	-0.0128
	(0.0645)	(0.0647)	(0.0416)
Day 4	-0.0499	0.1363**	-0.0053
	(0.0592)	(0.0594)	(0.0382)
Treatment, Intervention	-0.0518	-0.0649	0.0860**
	(0.0624)	(0.0625)	(0.0402)
Inflation, 10x12 × Day 2	0.1457*	-0.0050	-0.0318
	(0.0840)	(0.0842)	(0.0541)
Inflation, 10x12 × Day 3	0.0854	0.0818	-0.0091
	(0.0848)	(0.0850)	(0.0547)
Inflation, 10x12 × Day 4	0.1179	-0.0796	-0.0172
	(0.0845)	(0.0847)	(0.0545)
Inflation, 10x12 × Treatment, Intervention	0.0166	0.0532	-0.0614
	(0.0838)	(0.0840)	(0.0540)
Day 2 × Treatment, Intervention	0.0522	0.0654	-0.0966*
	(0.0836)	(0.0838)	(0.0538)
Day 3 × Treatment, Intervention	0.1033	0.0057	-0.0859
	(0.0868)	(0.0870)	(0.0559)
Day 4 × Treatment, Intervention	0.0230	0.0574	-0.0806
	(0.0857)	(0.0859)	(0.0552)
Inflation, 10x12 × Day 2 × Treatment, Intervention	0.0458	-0.1499	0.0598
	(0.1178)	(0.1181)	(0.0759)
Inflation, 10x12 × Day 3 × Treatment, Intervention	-0.0750	-0.0902	0.1123
	(0.1188)	(0.1190)	(0.0765)
Inflation, 10x12 × Day 4 × Treatment, Intervention	0.0626	-0.0590	0.0708
	(0.1191)	(0.1194)	(0.0767)
Expectation sensitivity	0.0204	-0.0428	-0.0052
	(0.0287)	(0.0288)	(0.0185)
Expectation bias	0.0012*	-0.0011	0.0001
	(0.0007)	(0.0007)	(0.0004)
Perception sensitivity	0.1820***	-0.1112***	-0.1296***
	(0.0342)	(0.0343)	(0.0221)
Perception bias	-0.0003	0.0007*	-0.0001
	(0.0004)	(0.0004)	(0.0003)
R-squared	0.1700	0.1663	0.1201
R-squared Adj.	0.1299	0.1259	0.0776

Standard errors in parentheses.

* p<.1, ** p<.05, *** p<.01

Appendix A Table 8 - Forward-selected OLS regressions of change in performance measures on intervention and individual characteristics

Variables	(1) Final savings (%)	(2) Over-stock (%)	(3) Wasteful-stock (%)
Intercept	-0.3117	0.9420***	0.1018
	(0.1942)	(0.2073)	(0.1538)
BRET, total boxes collected		-0.0034**	
		(0.0015)	
Financially literate			-0.0580
			(0.0439)
Treatment, Intervention	-0.2862	-0.0221	-0.0832
	(0.1737)	(0.1081)	(0.1201)
Treatment, Control × Compound		-0.0921	
		(0.1026)	
Treatment, Control × Total switches			-0.0319*
			(0.0187)
Treatment, Control × WCST, number correct	-0.0020		
	(0.0071)		
Treatment, Intervention × Compound		-0.1398	
		(0.1284)	
Treatment, Intervention × Total switches			-0.0185*
			(0.0107)
Treatment, Intervention × WCST, number correct	0.0177**		
	(0.0074)		
Numerate		-0.1820*	0.1034**
		(0.0978)	(0.0494)
Wage quartile, 1		-0.1811*	
		(0.0979)	
Wage quartile, 2		-0.0673	
		(0.0968)	
Wage quartile, 3		-0.0709	
		(0.0971)	
Change in expectation bias		-0.0044*	
		(0.0024)	
Change in perception bias		0.0050***	
		(0.0018)	
Education level	0.0777	-0.0657	-0.0369
	(0.0487)	(0.0505)	(0.0266)
Can save in real life			0.0949*
			(0.0544)
Total switches	0.0234	-0.0176	
	(0.0165)	(0.0166)	
Risk aversion, safe choices		-0.0433**	0.0107
		(0.0169)	(0.0096)
Time preferences, smaller-sooner choices	0.0077		
	(0.0056)		

R-squared	0.1323	0.3534	0.1636
R-squared Adj.	0.0786	0.2600	0.0932

Standard errors in parentheses.

* p<.1, ** p<.05, *** p<.01

Appendix A.2. Savings Game instructions[d]

Instructions: Savings Game

We will now explain the Savings Game on the following pages. As mentioned before, you will complete play the game four times over the course of four days.

On the following pages, we will explain how the Savings Game works.

Comprehension and Practice Questions

As you go through the instructions on the following pages, we will ask you questions or have you perform certain tasks related to the Savings Game to confirm you understand the game's mechanics and rules.

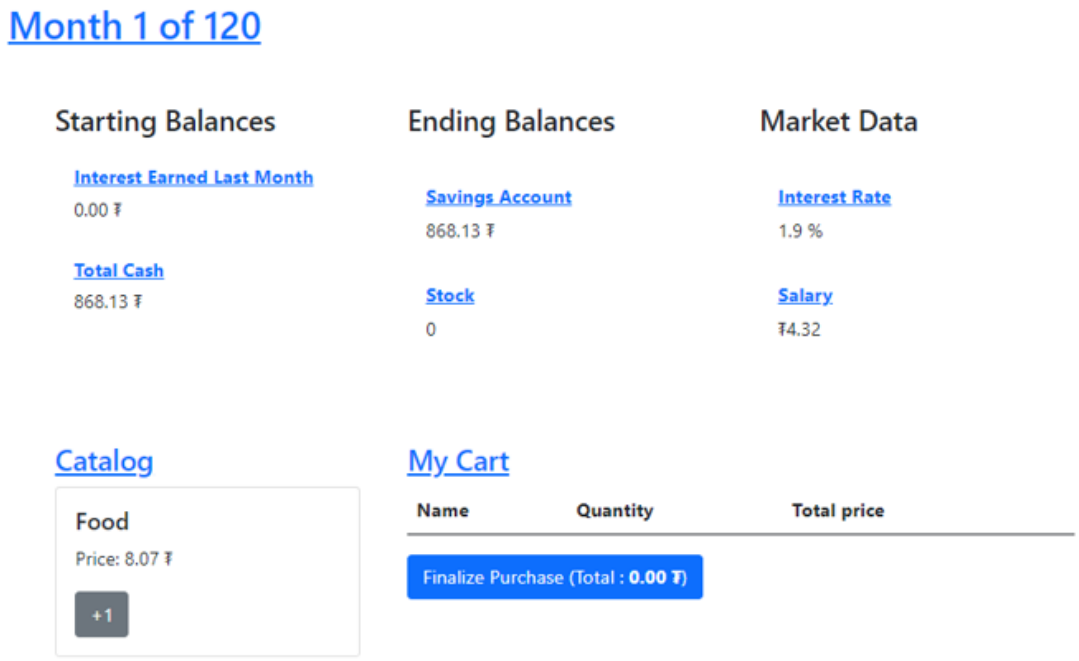
When you are ready to proceed, please click the Next below.

Game Screen

First, we will explain the game's mechanics. Then, we will explain the rules of the Savings Game.

The below is an example of the primary screen you will see and interact with during the Savings Game. On the next page, we explain each component of this screen.

[d] For a hands-on demo of the Savings Game instructions, visit https://savings-game.onrender.com/demo/instructions.



Appendix A Figure 1 - Instructions interface, guide for on-screen information (a pop-up messag appears when the blue titles are clicked with an explanation)

Game Screen

In this example of the primary game screen, certain titles are underlined with blue text. Click the titles in blue to learn what each component is.

*Once you have understood all components, practice using the screen by **adding 4 units** of Food to My Cart and click Finalize Purchase to proceed.*

Month 1 of 120

- Here you see how many months remain in the Savings Game. It last 120 Months in total.

Starting Balances

Interest Earned Last Month

- This shows how much interest you earned on your Savings Account in the previous month.

Total Cash

- Total Cash is how much money you have to spend each month on Food.

Ending Balances

Savings Account

- This shows you how much money you will keep for the next month after clicking Finalize Purchase at the bottom. It is also how much you will earn interest on.

Stock

- Here, you see how much Food you will have this month.

Catalog

- Catalog displays the current price of Food. To add units of Food to My Cart, click the grey +1 button as many times as needed.

Food

Price

My Cart

- My Cart shows you the Quantity of Food you have selected and the Total Price you will pay.

Name

Quantity

Total price

Finalize Purchase (Total:)

Game Screen

Ending Balance

As you adjust the Quantity of Food in My Cart, the values in Savings Account and Stock change. This helps you plan for the future.

Now, adjust the Quantity in My Cart so that the value in Savings Account is **851,99 ₮** and click Finalize Purchase to proceed.

Note: To **reduce the Quantity** in My Cart, click the grey button labelled "-1".

Game Screen

Now, adjust the quantity in your cart so that your Stock has **1 unit** of Food and then click Finalize Purchase.

Rules of the Savings Game

Now that you understand how to operate the game screen, we will explain the rules of the Savings Game.

Remuneration

As mentioned in the Introduction, you will receive additional study remuneration based on your performance in the Savings Game.

Your performance is based on the final value in your Savings Account at the end of the game (after 120 months). After completing the four rounds of the Savings Game (each 120 months) over the four days, a computer program will randomly select one of your rounds' and its corresponding final Savings Account result.

It will convert this amount to Euros (€) and add this value to your participation fee.

Conversion

The game's currency is denominated by **₮**. There is a conversion rate of: **823₮ = 1€**. This means that if the selected round's Savings Account value is 8230₮, you will receive an additional 10€.

Comprehension Question

The final value of which of these balances determines your performance-based remuneration for the Savings Game?

- Stock
- Interest earned
- Savings Account
- Total Cash

Survival

To survive from one month to the next, you must **eat one unit of Food each month**. The minimum amount you must have in your Stock to survive to the next month is 1. If during the Savings Game you end a month when your Stock value is 0, you die, and the game ends.

Every month, you have the option to buy Food at the price listed in the Catalog.

Since you only eat 1 unit of Food per month, any additional units you purchase in a month are saved in Stock. If you have Food in Stock, you are not obligated to buy any more.

Adding the current month number and the Stock value tells you until what month you can survive. For example, if in Month 7, you have 3 units, you will survive until Month 10.

Remuneration

Note: If the game ends because you are unable to end the month with your Stock equal to **1 or more**, the final amount of your Savings Account recorded for that day will be 0₮.

But, you can still earn additional remuneration for that day by answering follow-up questions and completing the day's supplementary tasks or questionnaires.

You also still have three other rounds to increase your remuneration.

Comprehension Question

What is the minimum amount you must have in your Stock before clicking the "Finalize Purchase" button to survive to the next month?

- 120
- 3
- 1
- 0

Interest Earned Last Period

You earn interest the following month on the amount in Savings Account when you click Finalize Purchase. The higher the amount of money in Savings Account, the more money you will earn in interest. At the start of a new month, the Interest Earned Last Month is added to your Total Cash.

The interest rate remains the same throughout the Savings Game.

For example, if a game's interest rate is 1,9% and the value in Savings Account is 868,13 ₮, the player will earn 16,47 ₮ the following month (868,13 ₮ X 0,019).

Comprehension Question

Can the interest rate change during the Savings Game?

- No
- It depends how much is in Total Cash
- Yes
- It depends how much is in Savings Account

Salary

In addition to the interest you may earn on your Savings Account, every month you automatically receive a monthly salary of 4,32 ₮. This amount is added to your Total Cash.

Total Cash

Total Cash is the sum of your previous Savings Account balance, the Interest Earned Last Month, and your monthly salary.

Comprehension

Suppose a player had 100₮ in Savings Account last month. If they earn 10₮ in interest and receive 20₮ in monthly salary, what will their Total Cash be?

- 130,00 ₮
- 120,00 ₮
- We do not have sufficient information to determine.
- 100,00 ₮
- 110,00 ₮

Follow-up Questions

Over the course of the Savings Game, you will be asked questions that relate to your experience.

Choice Confidence

Occasionally, after you finalize a purchase decision, you will be asked to rate how confident you feel about that decision on a scale from 1 to 5.

1 means you feel "Not at all confident to have made the right decision." 5 means you feel "Absolutely confident to have made the right decision."

Now, try answering a choice confidence question. Select the value that would reflect that you feel **completely indifferent** about your decision (i.e. neither confident nor unconfident).

How confident are you that you made the right decision this month?

- 1 – Not at all confident to have made the right decision
- 2
- 3
- 4
- 5 – Absolutely confident to have made the right decision

Follow-up Questions

Price Change Percentage Estimates

Also, every 12 months, you will be asked to estimate by what percentage (%) you think the price of **Food** changed during the previous 12 months. To make an estimation, you must select the desired value using a "slider" -- the blue bar shown below.

You will receive **493,80 ₮** for each of these questions that you answer correctly to within 3% (e.g. if the answer is 50% and you estimate any value between 47% and 53%, you earn an additional 493,80 ₮).

Note: This is meant to be simply your best guess, so you will have 10 seconds to respond.

Now, try using the slider below to select the value: **1%**. When you are done, click the "Next" button below it.

Click the blue bar to reveal the slider. Drag it along the bar to select your estimate.

Appendix A Figure 2 - Practice slider

Congratulations, you have completed the Savings Game Instructions and passed the comprehension test. We will now begin the Savings Game. Click the Next button below when you are ready to proceed.

Appendix A.3. Intervention[e]

The simple financial education is provided below. Note that after receiving the guidance, subjects complete a series of comprehension questions that present different combinations of inflation and interest rate and stock as in-task simulations and ask them:

1. whether they can buy more, less, or the same amount of the good as before and
2. what they should do in the presented situation (save, buy one unit, or buy more than one unit).

Explanation: Optimal Strategy

For the remaining two rounds of the game, we will explain the optimal strategy to maximize your final Savings Account balance.

Comprehension Questions

You must also answer some questions to confirm you understand the new information.

Click the Next button below to proceed.

Maximizing Your Final Savings Account Balance

Maximizing the final balance of your Savings Account during requires a strategy to minimize the cost of the 121 units of Food that you must buy during the game.

Inflation Rate

In the game, the Inflation Rate corresponds to the rise in the price of Food. Depending on your expectations of inflations, it may be that you must buy more in advance to avoid paying more for Food later.

Interest Rate

At the end of each month, the balance in your Savings Account increases by 1.9% thanks to the Interest Rate. But, if next month's Inflation Rate is greater than the Interest Rate, you will not be able to buy as much Food in the next month as now.

Comprehension

The Inflation Rate is related to:

[e] For hands-on demo of the intervention, visit https://savings-game.onrender.com/demo/intervention.

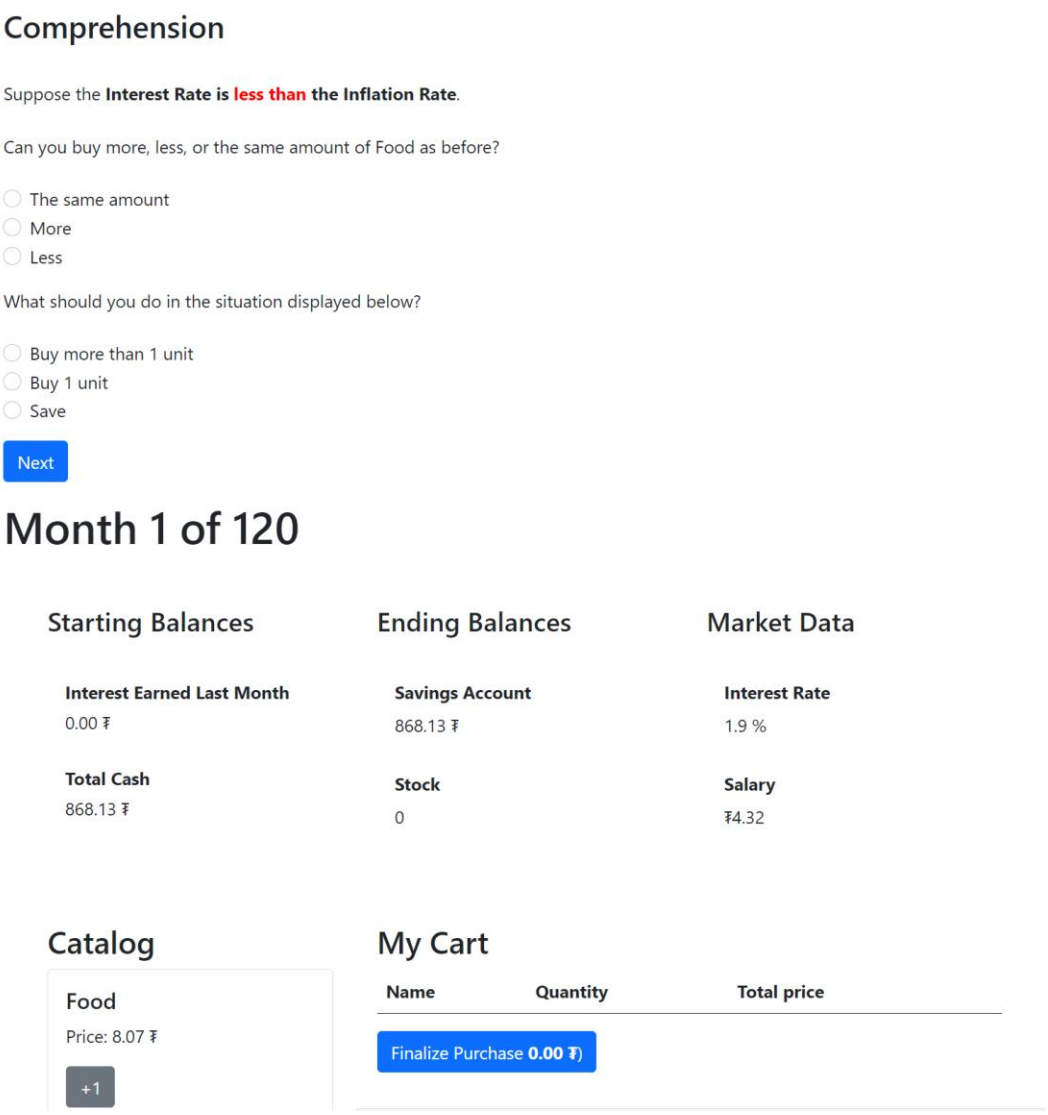
- An increase in the price of Food
- Interest Rate
- None of the above
- An increase in Salary

The Optimal Strategy

To buy at the lowest cost and maximize your final balance, you must buy **only 1 unit** of Food per month when the **Interest Rate is greater than the Inflation Rate**.

When **the Interest Rate is less than Inflation Rate**, you must **stock up** on Food so that you do not need to buy it at the higher price later.

The quantity you buy should be sufficient to create a Stock equal to the number of months you expect to Inflation Rate to be greater than the Interest Rate.



Appendix A Figure 3 - Example of comprehension question

Appendix A.4. Opportunity cost calculation

As explained in the intervention, the best strategy is to save money when $r > \pi_t$ and, as soon as $r < \pi_t$, stock up sufficient units of the good to survive until the end. Being the case, achieving the maximum final savings account balances in the 4x30 and 10x12 sequences requires buying one unit of the good per day until periods 31 and 13 respectively and then buying 90 and 108 units of the good respectively all at once. Divergences from this maximum possible savings, therefore, result from three types of purchase errors: over-, under-, and wasteful-stocking. Each of these errors produce an opportunity cost.

When a subject over-stocks, they forgo the interest on the additional money spent; the opportunity cost is equal to the difference between the interest they could have earned by waiting and the money they save by buying at a lower price. Conversely, the opportunity cost of under-stocking is the difference between the interest they would have earned on the money they could have saved by buying at a lower price and the extra interest they earned by saving for longer. The opportunity cost of purchasing unit i of the good in period t can be represented for both over- and under-stocking as:

$$C_i^t = p^t(1+r)^{120-t} - p^{t^*}(1+r)^{120-t^*},$$

where $i \leq 121$ and $t^* = 31$ for the 4x30 sequence and $t^* = 13$ for the 10x12 sequence. Finally, where over- and under-stocking opportunity costs are the difference between interest earned and foregone, the opportunity cost of wasteful-stocking is strictly the total interest foregone by spending money unnecessarily. It can simply be represented, therefore, as:

$$C_i^t = p^t(1+r)^{120-t},$$

where $i > 121$.

Appendix A.5. Additional in-task measures

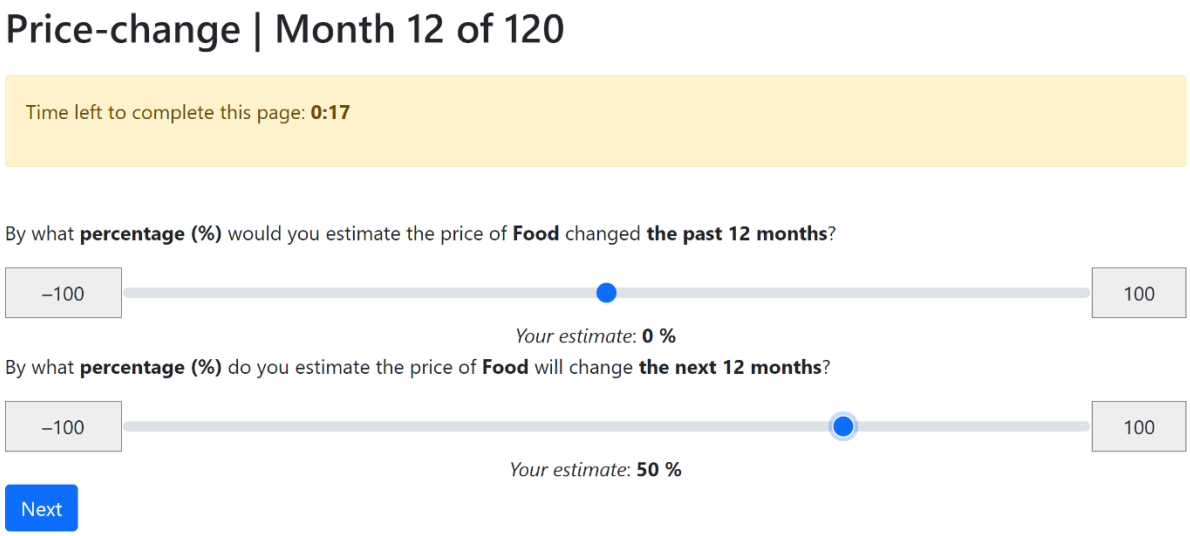
Response impulsivity – Response time

During the consumption simulation, subjects' response time is captured in milliseconds and can be used as a proxy for their response impulsivity, where the faster the response time, the greater the response-impulsivity level (Basar et al., 2010).

Perceived and expected inflation – In-task inflation estimation

Every twelve periods in the Savings Game, we measure subjects' perceived inflation for the preceding twelve periods and expected inflation rate for the next twelve periods. Both measures are elicited through a *slider*, horizontal percentage scale ranging from -100 % to + 100 % in 1% increments as shown in Appendix A Figure 4 below.

Subjects have 30 seconds to provide estimates for inflation rates of both the last and next 12 periods. If they do not click the Next button before the 30 seconds are up, whatever values they currently have selected on the sliders are submitted, and if they do not have values submitted, values of 0% are inputted automatically. We set a time limit to elicit subjects' instinctive estimations, lightly disincentivizing the calculation of the actual percent change



Appendix A Figure 4 - Example of in-task inflation estimation elicitation sliders

Perceived inflation – Post-task inflation estimation

Perceived inflation can be measured as an overall inflation rate estimate via the question "How much do you think prices increased overall?" and compared to the actual average inflation rate during the simulation, as elicited in Georganas et al. (2014).

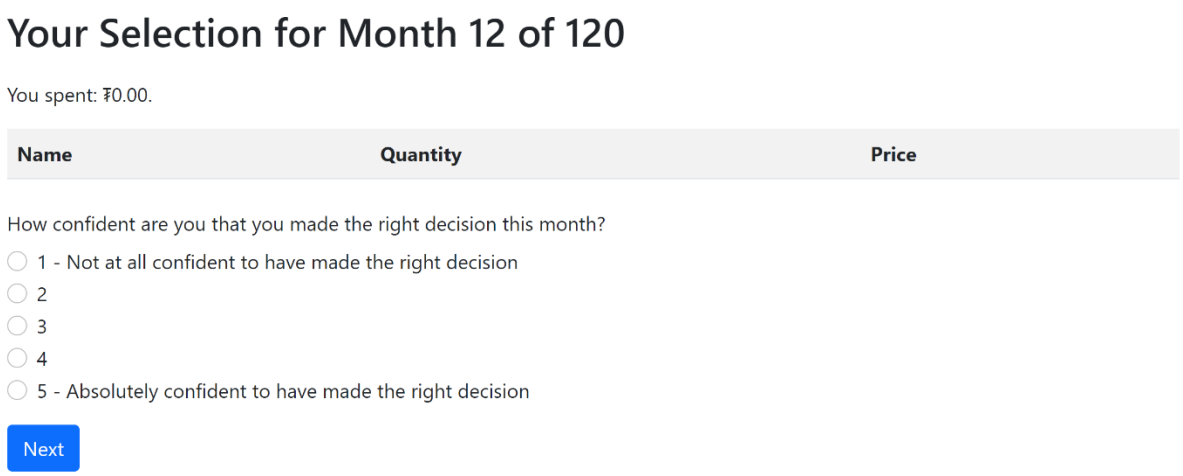
Perceived inflation – Post-task price memory

Perceived inflation can also be measured through inflation estimations of individual goods by asking "How much did the item's price change overall?" and/or "How much did the good cost in the beginning? At the end?" and then calculating a perceived inflation rate based on those data (Georganas et al., 2014).

Choice confidence

After finalizing a purchase decision (either after each decision or on a regular interval), subjects must respond to the questions "How confident are you with your decision?" by selecting an integer from 1 to 5, where 1 indicates "not at all confident" and 5 "absolutely confident" (Fehr & Tyran, 2001). See Appendix A Figure 5.

For both inflation sequences, we elicit choice confidence every twelfth and thirtieth month to coincide with the changes in inflation but obfuscating which sequence subjects face. We also elicit choice confidence the following the month to capture any change in confidence with changes in inflation.



Appendix A Figure 5 - Example of choice confidence elicitation question

Appendix A.6. Knowledge measure questionnaires

Financial literacy

A subject's financial literacy is determined by their correctly responding to the "Big Three" questions from Lusardi and Mitchell (2009). We also include a question on investment product risk categorization from Arrondel and Masson (2014). If a subject fails to answer correctly question 3 of the Big Three but correctly categorizes the investment products' risk, we consider them financially literate.

These questions, with answer choices and correct answer indicated, are:

Question 1

Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

- More than $102**
- Exactly $102
- Less than $102
- Do not know

Question 2

Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?

- More than today
- Exactly the same
- Less than today**
- Do not know

Question 3

It is usually possible to reduce the risk of investing in the stock market by buying a wide range of stocks and shares, true or false?

- True**
- False

Question 4

Below are four financial products. Order them 1 to 4 (from the least risky to the riskiest in your opinion).

Savings account[f]

- 1 – the least risky**
- 2 – the second least risky
- 3 – the second most risky
- 4 – the riskiest

Stocks

- 1 – the least risky
- 2 – the second least risky
- 3 – the second most risky
- 4 – the riskiest**

Bonds

- 1 – the least risky
- 2 – the second least risky**
- 3 – the second most risky
- 4 – the riskiest

Mutual funds[g]

- 1 – the least risky
- 2 – the second least risky

[f] "Livret A"
[g] "SICAV/Fond commun de placement (FCP)"

- 3 – the second most risky**
- 4 – the riskiest

Numeracy

Numeracy is determined through the Berlin Numeracy Test (Cokely et al., 2012), in particular the adaptive version with the questions and respective correct answer listed below. A subject is determined to be numerate if they correctly answer either question 2.b or 3. This means they answer question 1 correctly and move to question 2.b; however, if they miss this second question, they are given question 3 as a follow-up. If they answer question 3 correctly (or 2.b directly), we classify them as numerate.

Question 1

Out of 1,000 people in a small town 500 are members of a choir. Out of these 500 members in the choir 100 are men. Out of the 500 inhabitants that are not in the choir 300 are men. What is the probability that a randomly drawn man is a member of the choir? _____ (%)

- 25

Question 2.a

Imagine we are throwing a five-sided die 50 times. On average, out of these 50 throws how many times would this five-sided die show an odd number (1, 3 or 5)? _____ out of 50 throws.

- 30

Question 2.b

Imagine we are throwing a loaded die (6 sides). The probability that the die shows a 6 is twice as high as the probability of each of the other numbers. On average, out of these 70 throws how many times would the die show the number 6? _____out of 70 throws.

- 20

Question 3

In a forest 20% of mushrooms are red, 50% brown and 30% white. A red mushroom is poisonous with a probability of 20%. A mushroom that is not red is poisonous with a

probability of 5%. What is the probability that a poisonous mushroom in the forest is red? _____ (%)

- 50

Compound-interest capability

A subject compound-interest capability is determined through their correctly answering the following questions, with correct answers listed below, from Macchia et al. (2018), where questions 2 and 3 are multiple choice:[h]

Question 1

If inflation is 10% a year, and a product currently costs 1000 €, how much will it cost in one year's time?

- 1100

Question 2

If inflation is 50% a year, and a product currently costs 1000 €, how much will it cost in two years' time?

- Less than 2000
- More than 2000**
- 2000 €

Question 3

If inflation is 3% a year, and a product currently costs 1000 €, how much will it cost in five years' time?

- More than 1150**
- 1150 €
- Less than 1150

Question 4

If inflation is 100% a year, and a product currently costs 1000 €, how much will it cost in five years' time?

- 32000

[h] We randomize the order of choice options.

Appendix A.7. Economic preference tasks

Time preferences

To measure time preferences, we use an intertemporal randomized choice sequence very similar to Cohen et al. (2016). Subjects must complete a binary choice task, whereby they must choose between a series of smaller-sooner and larger-later payouts.

Subjects are presented with three choice tables between a sooner option ("right now") and a later option (one period, six periods, or one year). Each table provides subjects with ten choices (one per row) between the fixed smaller-sooner option of €20 in one column and a larger-later option in the other (ranging from €20 to €200). The ten payment decisions are presented in a randomized order. After completing the table for one of the three possible delays, subjects are presented with the next; the order of delays is also randomized. Time preference is measured by the number of times the smaller-sooner reward was chosen over the larger-later one across the 30 decisions.

Risk preferences

Risk preference is measured in two ways. First, we use the Holt and Laury (2002) lottery choice procedure to elicit risk aversion. Subjects make a series of choices between two lotteries with differing payoff options. The more certain option (A) offers payoffs of either €2.00 and €1.60, while the risky option (B) offers €3.85 and €0.10. Subjects make 10 choices, with the probability of high gains ranging from 10% to 100% by increments of 10%. All the choices are displayed simultaneously and randomly in one table. Afterwards, one of the subjects' 10 lottery choices is randomly selected and played; the resulting payoff is added to their final remuneration. We measure risk aversion by the number of times the certain option is chosen.

Second, we use the bomb risk elicitation task (BRET) by Crosetto and Filippin (2013) using the oTree module developed by Holzmeister and Pfurtscheller (2016). Subjects must collect boxes arranged in an 8x8 matrix that each offers a payoff $\gamma = ₮100.00$. One of the 64 boxes, however, hides a bomb, which if uncovered zeroes all earnings. We measure risk aversion by the number of boxes collected: The greater the number, the greater an individuals' risk tolerance.

Loss aversion

To assess subjects' loss aversion, we conduct a lottery choice task with loss. Subjects are presented a series of risky choices in a table, whereby they must choose between flipping a

coin, which offers a payout for tails but incurs cost for heads, and not flipping and thus gaining or losing nothing. In-line with Gächter, Johnson, and Herrmann (2022), we offer subjects six unique lotteries with potential losses ranging from ₮400.00 to ₮1400.00, in increments of ₮200.00, and a fixed potential gain of ₮1200.00. As per expected utility, loss-neutral agents should choose to play lotteries with losses between ₮400.00 and ₮1000.00, whereas loss-averse individuals reject lotteries that present positive expected values. We measure loss aversion as the number of times they choose not to flip the coin.

Wisconsin card sorting task

We assess subjects' adaptability to changing environments through a Wisconsin card sorting task (WCST). Each turn, subjects receive a master card with a unique combination of shape (circle, triangle, plus sign, or star), color (red, yellow, blue, green), and number of shapes (1-4). They also receive a set of four other cards, each with its own unique combination, one of which is a "match" with the master card based on a rule that is not told to the subject (Axelrod et al., 1992; Leshem & Glicksohn, 2007). The subject must guess which card is the match based on having the same shape, color, or number or shapes and is given feedback if they guess correctly or not. After a certain number of correct guesses, the rule changes, and so subjects must recognize this environmental change and discover and readjust to the new rule. The task last 30 turns, and subjects are remunerated ₮50 for each correct guess. We use their total number of correct guesses as a measure of their adaptability.

Preference inconsistency (switches)

Beyond subjects' overall time preferences and risk and loss aversion, we can also measure their choice inconsistency, which provides a proxy for determining an individual's tendency to deviate from economic rationality (Kurtz-David et al., 2019). We calculate this as the number of times the subjects switch between choice options. For time preferences, this means the number of times a subject changes between the smaller-sooner and larger-later options within a single set of delay choices. For risk aversion, this is the number of times they switch from option A to option B lotteries. For loss aversion, this is the number of times subjects switch between flipping and not flipping the coin. In all three tasks, a choice-consistent individual should only switch once per choice set at their point of delay, risk, or loss indifference. Any additional switches result from inconsistent choice behavior.