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Abstract

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JEL Classification: C81, C93, D83, E31, R31

Keywords: exchange rate, inflation, Expectations, Field experiment, Consumption

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Macroeconomic Expectations and Credit Card Spending*

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1 Introduction

Models of macroeconomics and household finance that use the Euler equation to microfound individual behavior typically assume that the savings and consumption choices of households respond directly to changes in macroeconomic expectations. This notion is so deeply ingrained in economic thought that it is often taken for granted. However, surprisingly little causal evidence exists on the effect of macroeconomic expectations on consumer behavior.

Recent insights from behavioral economics provide several reasons why the link between macroeconomic expectations and household behavior could be more tenuous than is generally assumed. The typical household may, for example, not be sophisticated enough to understand how to optimally revise consumption plans in response to changed macroeconomic expectations, make inference mistakes that prevent optimal intertemporal substitution, or be uncertain about how to interpret information about macroeconomic events (Andre et al., 2022; Giglio et al., 2021). Macroeconomic expectations may also not be sufficiently salient, especially when consumers make spending decisions involving small transaction amounts. The resulting failure of consumers to factor macroeconomic expectations into their decisions could have far-reaching consequences for the impact of various macroeconomic policies, such as forward guidance, that are explicitly based on the premise that changes in expectations will affect consumer behavior and real economic activity (Bernanke, 2007; Coibion et al., 2023).[1]

In this paper, we provide novel evidence on the causal effect of macroeconomic expectations on consumption decisions. We conduct an information-provision experiment with credit card customers of a large commercial bank in an emerging market and focus on two of the macroeconomic variables that arguably receive the most attention in models of household finance and macroeconomics: the inflation rate and the foreign exchange rate. In the experiment, we provide credit card customers with randomized expert forecasts of inflation and the nominal exchange rate and examine how this information affects macroeconomic expectations, spending plans, and *actual* consumption decisions, observed in detailed transaction-level data on credit card spending among experimental participants.

We collaborate with the consumer finance division of a large Malaysian bank and integrate a randomized experiment into the bank's standard customer communications. The experiment was implemented as part of a phone survey with the partner bank's credit card customers and proceeded in four steps. The survey first elicited respondents' exchange rate and inflation expectations. Second, randomly chosen subsets of the sample population were provided with expert forecasts of inflation, the exchange rate, or both. Third, we elicited participants' posterior beliefs and self-reported spending plans, using questions similar to those employed in the elicitation of prior beliefs. Finally, we merged results of the survey experiment with comprehensive transaction-level data on credit card spending provided by the partner bank. This allows us to examine the impact of macroeconomic expectations on actual consumption behavior, observed free of measurement error in credit card transaction data.

The setting and customer population we use in our experiment have several advantages that help us explore the link between macroeconomic expectations and economic decisions. Macroeconomic

[1] The Federal Reserve, for example, explains on its website that "when central banks provide forward guidance, individuals and businesses *will* use this information in making decisions about spending and investments. Thus, forward guidance about future policy can influence financial and economic conditions today." See `www.federalreserve.gov/faqs`

trends in Malaysia are quite representative of many small open economies and, as such, provide an interesting contrast between the evolution of inflation and exchange rates. On the one hand, the inflation rate has been stable at low levels over the past decades: since 2005, the inflation rate has hovered between 1% and 3% per year. The nominal exchange rate, on the other hand, has been highly volatile, with two-digit depreciation swings over the same period: since 2005, the exchange rate has fluctuated between 3.08 and 4.45 Malaysian Ringgit (MYR) per US Dollar (US$). This volatility, combined with a high share of imported goods in the average household's consumption basket[2] means that, at least according to models of inattention, it may be comparatively more important for consumers to keep up to date with the exchange rate and factor exchange rate expectations into their spending decisions. This feature of the study setting allows us to benchmark the effect of information on macroeconomic indicators with different levels of salience, which can help us shed light on the effects of policy changes in different macroeconomic environments, such as high- versus low-inflation regimes. Another advantage of our setting lies in the characteristics of the sample population. Individuals in our sample are among the most educated and financially experienced and thus should be one of the populations that is most likely to revise consumption decisions in line with macroeconomic expectations. As the consumers in our study are relatively affluent, their consumption bundle contains significant shares of durable and tradable goods, which correspond to the categories one would expect to be most affected by changes in exchange rate and inflation expectations.

We present two main results. The first result is that the information provided in the experiment has a strong effect on the formation of consumer expectations. The vast majority of individuals whose inflation and exchange rate expectations are not in line with expert forecasts update their expectations in response to our information treatments. Specifically, a 1 percentage point (ppt) increase in the information shock about future inflation increases inflation expectations by 0.237 ppt (p-value<0.001). Similarly, a 1 pp increase in the information shock about the future nominal exchange rate increases exchange rate expectations by 0.065 ppt (p-value=0.036). The finding that expectations are more responsive to information about inflation than to information about the nominal exchange rate is consistent with consumers in our setting having greater incentives to be informed about the exchange rate and thus having stronger prior beliefs.

The second result is that changes in macroeconomic expectations induced by our experiment do not translate into changes in consumption behavior in the direction predicted by a standard model of intertemporal consumption choice. Specifically, we test three basic predictions from a standard model of optimal consumption: (i) higher inflation expectations should increase spending on durables; (ii) higher expected exchange rate depreciation should increase spending on tradable durable goods; and (iii) conditional on the nominal interest rate, higher inflation expectations should increase credit card borrowing. We do not find empirical support for any of these predictions. Instead, the effects of information shocks induced by the experiment on spending are close to zero and statistically insignificant.

[2] While comprehensive data on the import content of different consumption categories is not available for Malaysia, data for the limited number of categories where such information is available point to a high import content and thus a potentially important link between the exchange rate and consumer prices. The largest category in the Malaysian consumption basket, for example, is food and non-alcoholic beverages, which accounts for 30.2% of total consumption for the average household and has an import content of 60%.

For specific spending categories, such as durables consumption, the point estimates suggest a *reduction* in spending in response to an anticipated increase in inflation and exchange rate devaluations, contrary to the predictions of a standard model of intertemporal choice. While we cannot rule out small effects on any specific outcome, we have sufficient statistical power to rule out moderate or large effects. Moreover, shocks to expectations do not affect self-reported spending plans, which we elicit immediately after the information-provision part of the survey experiment.

To better understand *why* changes in macroeconomic expectations do not affect spending decisions as predicted by standard models of consumer choice, we conduct an additional "mental model experiment." In this follow-up experiment, participants were presented with randomly assigned inflation and exchange rate scenarios and asked about their spending plans in each scenario. As part of this exercise, we additionally elicited measures of financial literacy and demand for inflation-indexed securities, which allow us to further narrow down which consumers respond to macroeconomic information. We explore several mechanisms that could explain the absence of a spending response by testing how the response to randomly assigned macroeconomic scenarios varies with consumer characteristics and complement this evidence with results from the main experiment.

Our preferred interpretation, based on the results of this exercise, is that consumers reduce spending in anticipation of nominal rigidities. That is, consumers appear to be sophisticated enough to understand that their income is not indexed to inflation or the exchange rate and reduce spending, especially on durable goods, for precautionary reasons because they correctly anticipate the purchasing power of their income to decline as inflation rises or the value of the local currency depreciates. This counteracts the effects of exchange rate devaluations and heightened inflation expectations on spending predicted by a standard model of intertemporal choice and explains the lack of a spending response to changed macroeconomic expectations. Moreover, our results are not qualitatively different between the consumer response to changes in inflation or exchange rate beliefs, which suggests that the mechanism we illustrate is not limited to one specific macroeconomic variable.

We discuss, and provide evidence against, a number of alternative mechanisms that could explain the absence of a spending response. One alternative explanation is that consumers are unable to interpret the information that is provided to them, or might not be sophisticated enough to re-optimize their spending plans based on revised macroeconomic expectations.[3] Indeed, substantial evidence suggests that consumers fail to optimize in many simpler economic decisions, either due to behavioral biases or lack of knowledge (see Campbell et al., 2011; Beshears et al., 2018). In the context of credit card spending, Ponce et al. (2017) and Gathergood et al. (2019) show that consumers do not borrow using the lowest interest rate card and do not prioritize repayment of the card with the highest interest rate.[4] We present several tests of this hypothesis and find that lack of financial knowledge is unlikely to explain our results. We first show that respondents in our setting update their expectations substantially in response to the information that is provided to them, which rule out the possibility that consumers are entirely unable to interpret the information given to them in the experiment.

[3] News about macroeconomic events may, for example, not affect consumer expectations in the first place, if they are not sufficiently salient, or if consumers are unable to interpret them. Coibion et al. (2021) show evidence of this in the case of the Federal Reserve's announcement of its new average inflation targeting policy.

[4] See also Chetty et al. 2020, who show that credit card spending fails to react to anticipated income shocks.

Moreover, we show that consumers with high (above median) financial literacy, as measured using a standard test, do not respond differently to inflation and exchange rate information than consumers with low (below median) financial literacy. In addition, both groups show substantial demand for indexed securities when presented with a high inflation or high exchange rate depreciation scenario, which suggests a relatively high degree of consumer sophistication.

Second, we test whether the absence of a spending response can be explained by time inconsistency and commitment problems. Specifically, it is possible that consumers revise their spending plans in response to updated macroeconomic expectations but are unable to follow through on these plans due to self-control problems. We provide a direct test of this hypothesis. If self-control problems were responsible, we would expect the information treatments to affect spending plans but not actual spending. Instead, we use self-reported spending plans, elicited immediately after the information provision stage of the experiment to show that providing information about inflation or the exchange rate has no impact on self-reported spending plans.

Third, we can also rule out the possibility that consumers reduce spending because they associate higher inflation or anticipated exchange rate depreciations with worsening overall economic conditions. Results from the main experiment show that our information treatments have no effect on participants' expectations about their personal financial situation or the overall state of the economy.

Finally, it is possible that the effects of information shocks on expectations are not sufficiently long-lasting to affect consumer decisions. We provide some evidence against this interpretation. First, we find that our results are robust if, instead of looking at spending behavior in the subsequent three months, we look at shorter time horizons.[5] Second, we show that information shocks do not affect spending plans, which are self-reported immediately after the information-provision experiment when one would expect the information to still be fresh and salient. Third, evidence from several other studies suggests that providing information through an experiment tends to have long-lasting effects on expectations. For instance, the effects of information shocks on inflation expectations last for at least a few months (Cavallo et al., 2017). Shocks to other economic beliefs have been found to last from months up to one year (Bottan and Perez-Truglia, 2020b; Fehr et al., 2019). Fourth, information experiments similar to the one in this study have been shown to affect high-stakes decisions (see Haaland et al., 2023, for a review): employees work harder after increasing their expectations of future salary increases, and home sellers are less likely to sell their homes when their home price expectations increase (Cullen and Perez-Truglia, 2022; Bottan and Perez-Truglia, 2020a). Information interventions have also been shown to have meaningful effects on personal financial decisions. Bursztyn et al. 2019 show that information about the moral and material consequences of delinquency improves credit card repayment and savings and investment decisions in response to feedback about the choices of their peers, and Beshears et al. 2015 and Bursztyn et al. (2014) show that people revise their savings and investment decisions in response to information about the choices of their peers.

Our study of macroeconomic expectations and consumer behavior relates to several strands of the literature. First, and most directly, our paper relates to research on the role of subjective expectations in macroeconomics and household finance (Roth and Wohlfart, 2020; Beshears et al., 2018). Macroe-

[5] These results are available upon request

conomic expectations play a central role in models of household finance and macroeconomics that rely on the consumption Euler equation to microfound individual saving and consumption behavior. While traditional economic theory assumes that individuals form statistically optimal expectations based on all available information, the available evidence shows that there are large information frictions and wide disagreement in the interpretation of macroeconomic information (Mankiw and Reis, 2002; Mankiw et al., 2003; Armantier et al., 2016; Cavallo et al., 2016, 2017; Andre et al., 2022; Giglio et al., 2021; Roth and Wohlfart, 2020). Growing evidence shows how macroeconomic expectations are formed, and which deviations from optimality are common. Andre et al. (2022) examine how individuals rationalize changes in macroeconomic conditions using narratives that place different weight on alternative propagation mechanisms and show that this heterogeneity may explain disagreement in beliefs among agents who observe the same macroeonomic shock and have access to the same information set. Similarly, D'Acunto et al. (2023) show that cognitive ability correlates with the ability to form accurate macroeconomic expectations in the cross-section. Less is known, however about how individuals factor macroeconomic expectations into their economic decisions (Armantier et al., 2015).

We make two contributions to this line of research. First, our paper is the first to examine the impact of economic expectations using macroeconomic variables that have plausibly different degrees of salience to consumers. Specifically, we focus on the response to inflation and exchange rate expectations, the two macroeconomic variables that have arguably received the most attention in the policy debate and in academic research. While inflation has been low and stable in recent decades and are thus arguably less salient for most households, large fluctuations in the nominal exchange continue to be commonplace around the world and have meaningful economic consequences for many households (Gouvea, 2020; Cravino and Levchenko, 2017). By comparing the response to exchange rate and inflation information, we can shed light on whether belief formation and behavior differ based on the salience of the macroeconomic indicator in question. This has policy implications, for example for the optimal communication of monetary policy in high- versus low-inflation environments.

Second, along with contemporaneous work by Coibion, Gorodnichenko, and Weber (2022), our paper is the first to measure the impact of macroeconomic expectations on *actual* spending, observed free of measurement error, rather than self-reported survey measures of consumption. We observe consumption decisions using detailed transaction-level data on credit card spending in a setting where credit card transactions account for a meaningful share of total consumption.[6] This overcomes several limitations of existing studies that rely on survey data to measure impacts on behavior, and are therefore susceptible to misreporting, measurement error, and experimenter demand effects. Indeed, we provide evidence that concerns about survey data should be taken seriously, as we document a surprisingly weak correlation between self-reported spending plans and actual spending decisions.

Finally, this study also speaks to a literature on the impact of expectations on personal financial decisions more generally. Giglio et al. (2021) and Giglio et al. (2020) use survey data to test how macroeconomic beliefs affect the decisions of retail investors. They show that beliefs are reflected in asset allocation and change in response to discrete macroeconomic events, such as a stock market

[6] Based on income data provided by our partner bank, the estimated ratio of credit card spending to monthly income is approximately 35% in our sample. This is comparable to the level of credit card spending in most high-income economies.

crash. Aaronson et al. (2012), Agarwal et al. (2007), and Agarwal and Qian (2014) use credit card data to test consumer responses to wage increases, tax changes, and unanticipated income shocks and find effects inconsistent with fully rational expectations. Beshears et al. (2015) survey the literature on behavioral household finance and highlight the important role of subjective expectations. We contribute to this literature by examining how macroeconomic expectations influence the fundamental intertemporal savings and consumption decisions that lies at the heart of household finance.

The remainder of the paper is structured as follows. Section 2 provides a stylized theoretical framework to motivate our experimental design and develop our hypotheses. In Section 3, we summarize the institutional setting. Section 4 presents the research design and implementation of the experiment. In Section 5, we describe additional data sources and provide descriptive statistics. Section 6 reports the results, and the last section concludes.

2 Theoretical Framework and Hypotheses

We use a standard model of intertemporal consumer choice to motivate our experimental design. Letting subscript t denote the time period, we assume that the consumer faces an exogenous stream of nominal income Y_t and can have positive or negative holdings of an asset A_t that pays an exogenous nominal interest rate R_t. There are four types of consumption goods, which we can classify according to their durability and tradability: durable tradables (denoted X_t^T), durable nontradables (X_t^N), nondurable tradables (C_t^T), and nondurable nontradables (C_t^N). We assume that durable goods depreciate at a rate of δ, tradable goods (both durable and nondurable) have an exogenous price P_t^T, and nontradable goods (both durable and nondurable) have price P_t^N. The consumer gets utility $U(C_t^N, X_t^N, C_t^T, X_t^T)$ from a given combination of goods, which is concave in each of its arguments and has a discount factor β.

The consumer's optimization problem can thus be summarized as follows:

$$\max_{\{C_t^N, X_t^N, C_t^T, X_t^T, A_t\}_t} \sum_{t=1}^{T} \beta^t U(C_t^N, X_t^N, C_t^T, X_t^T) \tag{1}$$

subject to

$$\begin{aligned} P_t^N(C_t^N + X_t^N - X_{t-1}^N + \delta X_{t-1}^N) + P_t^T(C_t^T + X_t^T - X_{t-1}^T + \delta X_{t-1}^T) + A_{t+1} \\ \leq P_t^N Y_t + R_t A_t \end{aligned}$$

We denote the exogenously given rate of inflation from period t to $t+1$ as π_{t+1}, which is defined as follows:

$$\pi_{t+1} = \frac{P_{t+1}^N(\bar{C}_t^N + \Delta\bar{X}_t^N) + P_{t+1}^T(\bar{C}_t^T + \Delta\bar{X}_t^T)}{P_t^N(\bar{C}_t^N + \Delta\bar{X}_t^N) + P_t^T(\bar{C}_t^T + \Delta\bar{X}_t^T)} = w_t\pi_{t+1}^N + (1 - w_t)\pi_{t+1}^T$$

$$\text{where} \quad w_t \equiv \frac{(\bar{C}_t^N + \Delta\bar{X}_t^N)}{(\bar{C}_t^N + \Delta\bar{X}_t^N) + P_t^T/P_t^N(\bar{C}_t^T + \Delta\bar{X}_t^T)}$$

$\bar{Z}$ is the average value of variable Z in the economy.

We make the following simplifying assumptions. First, an increase in inflation cannot be accompanied by a decrease in inflation in any specific category of goods:

Assumption 1 $\frac{d\pi^N_{t+1}}{d\pi_{t+1}} \geq 0, \quad \frac{d\pi^T_{t+1}}{d\pi_{t+1}} \geq 0$

Second, defining $d_{t+1} = \frac{E_{t+1}-E_t}{E_t}$ as the exchange rate depreciation between period t and t+1 (E_t denotes the spot exchange rate of the Malaysian Ringgit to the US Dollar at time t), we assume non-zero pass-through of exchange rate depreciation to tradables:

Assumption 2 $\frac{d\pi^T_{t+1}}{dd_{t+1}} \geq 0$

Third, we assume Cobb-Douglas instantaneous utility:

Assumption 3 *Let consumption utility be Cobb-Douglas with parameters α and θ corresponding to the weights of non-durables and non-tradables, respectively:*

$$U(C^N_t, X^N_t, C^T_t, X^T_t) =$$
$$\alpha\theta \log C^N_t + \alpha(1-\theta)\log C^T_t + (1-\alpha)\theta \log X^N_t + (1-\alpha)(1-\theta)\log X^T_t$$

This model yields the following three predictions (for proofs of each proposition, see Appendix A), which motivate the design of our field experiment:

Proposition 1 *Spending on durables (tradable and non-tradable) $P^N_t \Delta X^N_t + P^T_t \Delta X^T_t$ increases with expected inflation π_{t+1}.*

The intuition for this standard result (see, for example, Bachmann et al., 2015) is that one can buy durables to shield against the inflation tax.

The second proposition describes the effect of nominal exchange rate depreciation:

Proposition 2 *Spending on tradable durables $P^T_t \Delta X^T_t$ increases with future exchange rate depreciation E_{t+1}.*

The intuition is equivalent to that of the previous proposition: consumers want to consume durable tradables to shield against depreciation. If consumers expect the exchange rate to depreciate, they might be more likely to buy durable tradables such as electronics (as in one of our survey questions) now, because doing so in the future will be more expensive.

The last result describes the relationship between inflation expectations and debt:

Proposition 3 *Net borrowing $A_t - A_{t+1}$ increases with inflation π_{t+1}.*

This proposition states that when deciding how much debt or savings to accumulate, individuals care about the real interest rate. Holding constant the nominal interest rate, an increase in inflation will reduce the real interest rate.[7] As a result, an increase in the expected rate of inflation will make it attractive for consumers to borrow more (or save less).

[7] The assumption of a fixed nominal interest rate matches our setting where, as in many emerging markets, the regulator enforces an interest rate cap on credit card advances that is only slightly above the rates currently charged in the market.

3 Background and Setting

3.1 Macroeconomic and Institutional Context

We conduct a natural field experiment with credit card customers from a large commercial bank in Malaysia. Malaysia is representative of many small, open economies in that inflation has been stable and low over the past two decades, whereas the exchange rate has been volatile at times. Malaysia's central bank, the *Bank Negara Malaysia*, follows a mandated 2% inflation target, and its main policy instrument are changes in the overnight policy rate.[8] The central bank communicates the rationale behind changes in the policy rate as well as its future outlook through public 'monetary policy statements', which are released every two months. Thus, our study takes place in a setting where, similar to the United States and the Eurozone, forward guidance and the management of market expectations is an important goal of central bank communication.

Figure 2 presents historical data on inflation and the exchange rate. The figure first shows the evolution of the consumer price index over the last four decades. Over this period, Malaysia experienced a short period of high inflation in the early 1980s. However, since then, inflation has been generally moderate and stable at around 2% to 5% annually. Figure 2 also shows the evolution of the nominal exchange rate with respect to the U.S. Dollar. The exchange rate has been markedly more volatile than the rate of inflation. Indeed, the difference in volatility would be even more pronounced if we looked at weekly rather than yearly data, as inflation is stable over the year, while the exchange rate is characterized by sharp changes at shorter time intervals. Exchange rate volatility was most pronounced in the Asian financial crisis that began in 1997. During this period, the Malaysian Ringgit depreciated by more than 50% against the U.S. Dollar. Following this experience, Malaysia pegged its currency to the U.S. Dollar at a rate of 3.20 MYR/US$ between 1998 and 2005. Since the end of the currency peg, the exchange rate has fluctuated between 3.08 and 4.45 MYR/US$. Several large exchange rate swings have occurred in recent years, triggered by external and domestic events, such as oil price shocks and political instability surrounding national elections.

Because of its greater volatility and the relatively high share of imported goods in total consumption, it seems plausible that in our setting and time period, the foreign exchange rate is comparatively more salient and plays a larger role in consumer decisions than the rate of inflation. As our theoretical framework in Section 2 highlights, consumers can partially offset the effect of higher inflation by shifting their consumption towards durable goods. We therefore predict that a consumer who expects higher inflation will increase the relative share of durable goods in credit card spending to insure against inflation risk. However, given that inflation in our setting is typically between 2 and 5 percent, this is unlikely to be very meaningful for the consumer's overall finances. In contrast, when considering the purchase of tradable goods, such as consumer electronics or a car, the same consumer might be substantially affected by exchange rate fluctuations due to the magnitude in our setting. If the consumer, for example, expects a 20–25% exchange rate depreciation, the timing of such a purchase could amount to substantial savings.

To examine whether, in our context, changes in the exchange rate are in fact more salient to house-

[8] See https://www.bnm.gov.my for the statutes of *Bank Negara Malaysia* and recent monetary policy statements.

holds than changes in the inflation rate, we exploit data on online searches and newspaper articles. Figure 3 plots data from Google Trends that tracks the frequency of online searches. These data have been used in several previous studies to measure public interest in specific topics (see, for example, Perez-Truglia, 2020). Figure 3.a plots the frequency of online searches related to the terms "inflation" and "exchange rate", where dark bars correspond to keywords related to inflation and lighter-colored bars correspond to keywords related to the exchange rate. Google reports online searches only in relative terms. We therefore normalize the series, with the nominal exchange rate taking the value 100 in the first period. The figure shows that consumers seek information about the exchange rate more frequently than information about the inflation rate: in an average week of 2019, there were approximately 18 times more searches about the exchange rate than searches related to inflation.[9]

This pattern is supported by a comparison of newspaper articles mentioning either inflation or the exchange rate. Figure 3.b plots the frequency of articles in Malaysia's most widely read English language newspaper in which either term is mentioned.[10] As in Figure 3.a, both series are normalized so that the nominal exchange rate takes the value 100 in the first period. In an average week of 2019, there were approximately twice as many newspaper articles that referred to the exchange rate than newspaper articles mentioning the inflation rate. The two different data sources indicate both higher demand and higher supply for news about the exchange rate, rather than news about the inflation rate, in our setting.

3.2 Partner Bank

Our partner institution is one of the largest commercial banks in Asia and has more than a million individual customers in Malaysia. Nearly all of our partner bank's retail banking customers have debit cards, and a significant share additionally have credit cards linked to their account. Although our partner bank covers a broad, socially and geographically diverse customer base, its clients are naturally not a fully representative sample of the population. They are on average younger, more educated, more likely to reside in urban areas, and wealthier (see Section 5). Credit card usage in this setting is high and in fact comparable to high-income economies. Using the bank's administrative data, we estimate that monthly credit card spending in our data accounts for approximately 35% of consumers' estimated monthly income which is comparable to many advanced economies. In comparison, Ganong and Noel (2019) use data from the JP Morgan Chase Institute and find that average credit and debit card spending accounted for 51% of monthly income in the United States.[11]

We worked with our partner bank to integrate an information experiment into their regular customer communications and merge the experimental data with the bank's administrative records on credit card transactions. Our partner bank records credit card spending at the transaction level for all customers. The data are obtained directly from the bank and include date, time, and amount of the transaction, along with a location and type of transaction code. This allows us to time each transaction and assign it to a specific spending category and trace the impact of randomized information.

[9] The 2019 data cover the period when our experiment was conducted and are similar to other years.
[10] *The Star*, whose archive is available at www.thestar.com.my.
[11] Based on results from Table 1 of Ganong and Noel (2019), who use a sample of credit and debit card customers in the three months prior to becoming unemployed.

4 Research Design

4.1 Overview

Figure 1 provides a graphical summary of the research design. Our intervention is designed as an information provision experiment and administered through a phone survey with our partner bank's credit card customers. In addition to survey data, we observe pre-treatment and post-treatment administrative data covering the universe of credit card transactions for all participants of our study.

The intervention proceeds in the following four steps. First, all respondents are asked a set of standard questions on demographics and their general economic situation. Second, a survey module elicits macroeconomic expectations and provides randomly selected subsets of respondents with information about inflation, the exchange rate, or both. Third, we measure posterior beliefs to assess whether our information treatments affect respondents' expectations. Finally, we combine survey responses with administrative data on credit card spending to test whether the information provided affects subsequent consumption in the manner predicted by economic theory. We provide additional details on each of these steps in the following sections.

4.2 Sample Population

To construct the sample frame for our experiment, we first requested a list of credit card customers from our partner bank. We specified that this list should be restricted to customers who opened their accounts within the previous three years. We received a random sample of 33,000 credit card customers and invited these customers to participate in a phone survey, which included our information experiment.

The survey was conducted by a team of 11 call center operators who were trained to administer a short phone survey and supervised in person by a member of the research team. At the beginning of each workday, the operators were provided with a randomly selected list of credit card customers to call. The operators introduced themselves as surveyors working on behalf of researchers from UCLA and asked participants if they were willing to participate in a short survey about their economic expectations. If operators were unable to reach a respondent on the first attempt, they were instructed to make at least one further attempt at a later time.

4.3 Information Experiment

We integrated our experiment into this credit card customer survey administered by our partner bank. The survey instrument, which is available in Appendix D, can be divided into five parts: (i) collecting baseline information, (ii) eliciting prior beliefs, (iii) providing information to a random subset of respondents, (iv) eliciting posterior beliefs, and (v) self-reporting of consumption plans for all respondents. In this section, we describe each component of the intervention in turn.

4.3.1 Baseline Information

We begin with a set of standard questions on the respondent's socio-economic background, including employment status, highest level of education attained, marital status, and dependents. We do not ask about gender, age, or income as this information is available in the administrative records obtained from the partner bank. We also include one question about the expected economic conditions in the country over the next 12 months, for which the possible responses are "better off," "about the same," and "worse off." The language in this question, and all other questions about expectations, closely follows the wording used in the most widely used surveys of consumer expectations, such as the University of Michigan's Survey of Consumers and the Federal Reserve Bank of New York Survey of Consumer Expectations (see, for example, Bachmann et al., 2015; Fuster et al., 2020).

4.3.2 Elicitation of Prior Beliefs

Next, we elicit participants' inflation and exchange rate expectations at two points in time: immediately before the treated individuals receives information from the experimenter (*prior beliefs*) and after a randomly chosen subset of respondents is provided with an inflation or exchange rate forecast (*posterior beliefs*). The wording in both rounds is closely modeled on that used in standard surveys of consumer expectations, and was adjusted to our study context through qualitative interviews and an online pilot.

We elicit beliefs about the future inflation rate and exchange rate. To avoid artificially making one belief more salient than the other, we randomized the order of these two questions. To elicit inflation expectations, the surveyors first provide a definition of inflation by explaining that "[...] inflation is the measure of how prices in Malaysia change in general" and then elicit the respondent's expected inflation rate over the following 12 months.[12] Our wording is similar to that used in one of the most widely used surveys of inflation expectations, the Federal Reserve Bank of New York *Survey of Consumer Expectations*, which asks about the inflation rate directly.[13] Participants are asked to give their response in percentage points.

As documented in Section 3.1, the nominal exchange rate is already salient in news media and online searches in the country of study. This makes it more straightforward to elicit exchange rate expectations. To elicit respondents' nominal exchange rate expectations, the surveyor informs the respondent of the current nominal exchange rate ("as of April 2019, 1 U.S. Dollar is worth around 4.05 Malaysian Ringgit") and then asks what, in their opinion, "[...] the exchange rate will be 12 months from now, in April 2020". This way of eliciting beliefs is consistent with previous work by Cavallo et al. (2017) and was adapted to our research setting through a series of pilot tests and consumer interviews.

[12] Providing a definition is standard practice in surveys about inflation. The *Michigan Survey of Consumers*, for instance, avoids the term inflation and asks instead "do you think prices in general will go up, go down, or stay the same".

[13] Another widely used source of data is the *Michigan Survey of Consumers*, conducted by the Survey Research Center at the University of Michigan, which asks about *prices in general* instead of asking about inflation directly. See Armantier et al. (2016) for a discussion on how these differences in wording might affect responses. Given the similarity of the questions used to elicit expectations, we can benchmark our results to those of related studies that have used the *Survey of Consumer Expectations* data and, with some caveats that have been highlighted by Armantier et al. (2016) among others, to studies that used the *Michigan Consumer Survey* data.

4.3.3 Information Provision

In the information provision stage of the experiment, all respondents are first read the following message: "In this stage, we randomly select respondents to receive some feedback about the previous questions." Each respondent is then randomly assigned to one of the following three treatment groups with equal probability:

(a) Treatment *inflation*: In the first treatment condition, respondents receive a signal about the future inflation rate: "The consensus among experts from the government and private sector is that inflation in Malaysia will be 2.3% over the next 12 months."

(b) Treatment *exchange rate*: In our second treatment, respondents receive a signal about the future nominal exchange rate: "The consensus among experts from the government and private sector is that 1 U.S. Dollar in Malaysia will be worth 4.10 Malaysian Ringgit 12 months from now".

(c) Treatment *exchange rate and inflation*: In our final treatment condition, respondents receive two signals. The first one relates to the inflation rate: "The consensus among experts from the government and private sector is that inflation in Malaysia will be 2.3% over the next 12 months". The second one relates to the exchange rate: "The consensus among experts from the government and private sector is that 1 U.S. Dollar will be worth 4.10 Malaysian Ringgit 12 months from now".[14]

Expert forecasts of inflation and the exchange rate used in the experiment were obtained from widely used forecast websites and updated once over the course of the experiment to reflect a quarterly forecast revision.[15] Figure B.1 in the Supplementary Appendix reports information about the historical accuracy of forecasts from the sources used in the experiment. The figure shows that, historical inflation and exchange rate forecasts at the same time horizon used in the experiment are fairly accurate with a mean prediction error of 1.28 percentage points for inflation (0.97 percentage points when excluding an outlier during the pandemic) and 0.39 percentage points for the exchange rate.

4.3.4 Elicitation of Posterior Beliefs

The second round of belief elicitation takes place immediately after respondents are provided with information about inflation, the exchange rate, or both. To ensure that responses are comparable to the elicitation of prior beliefs, the second round of belief elicitation uses the exact same wording as the first. The goal of this second round of belief elicitation is to understand whether individuals incorporate the information provided to them through the information treatments into their expectations.

4.3.5 Elicitation of Consumption Plans

While the main goal of our experiment is to estimate the effect of information on *actual consumption*, as measured objectively in administrative data, we also asked a series of questions on respondents'

[14] The order of these two pieces of information was consistent with the (randomized) order of the questions on prior beliefs: i.e., if the prior inflation expectations was elicited before the prior exchange rate expectations, then feedback about inflation would come before the feedback about the exchange rate.

[15] Inflation forecasts are taken from *Statista* (www.statista.com), forecasts of the exchange rate come from *Trading Economics* (www.tradingeconomics.com).

self-reported *consumption plans*. These responses were collected after the elicitation of posterior beliefs and serve two purposes. First, they allow us to test whether our information treatments affect intended behaviors. With that goal in mind, we measure expected future spending in the main consumption categories highlighted by the theoretical framework (durable goods, tradable goods, and credit card debt), as well as other categories that act as useful proxies or benchmarks. Second, these questions allow us to confirm that survey responses have predictive content by testing whether predicted consumption correlates with actual future consumption.[16]

The first of these questions elicits respondents' expected change in total credit card expenditures (which corresponds to the total expenditures we observe in administrative data). Specifically, respondents were asked: "Do you expect your credit card spending to go up, stay the same, or go down during the next 3 months?" We code this and other similar questions on a simple three-step scale. the variable takes the value -1 if the individual responded "go down," 0 if the individual responded "stay the same," and +1 if the individual responded "go up." Another pair of questions uses similar language to elicit total spending, not limited to spending on credit cards, and spending on groceries for comparison.

The next set of questions on expected spending asks about spending on durable goods and uses wording that closely follows the Michigan Survey of Consumers. We first ask respondents: "Do you think now is a good time, a bad time, or neither a good nor a bad time to buy household items, such as furniture or a refrigerator?" We code responses using the same $\{-1, 0, +1\}$ scale as before. The variable takes the value -1 if the individual responded "No, it's a bad time," 0 if the individual responded "It's neither a good nor a bad time," and +1 if the individual responded "Yes, it's a good time." We include three additional questions using this same language, but instead of asking about durable expenditures, we ask about electronics, vehicles, and credit card borrowing, respectively.

One potential concern with our design is that the information treatments could affect behavior through a mechanism other than intertemporal optimization of consumption. Intuitively, information about inflation and the exchange rate could affect spending by changing respondents' general optimism or pessimism about the economy. For example, individuals who learn that there will be inflation or depreciation in the future may infer that these are symptoms of an economic downturn and interpret this as bad news for their personal economic situation. We include two questions to shed light on this potential mechanism in the questionnaire. The first asks respondents about their expectations for the economy overall, the second asks about the individual's own financial outlook: "Looking ahead, would you say that you and your family living with you will be better off or worse off financially than you are now?" We code both outcomes using the same $\{-1, 0, +1\}$ scale: -1 if the individual responds "Worse off," 0 if the individual responds "About the same," and +1 if the individual responds "Better off."

[16] We measure consumption plans only once, *after* the intervention, so as to not confound the prior and posterior elicitation exercise on inflation and exchange rate beliefs. Under the assumption that priors are balanced across treatment and control groups due to randomization, we interpret any differences in consumption plans as causal.

5 Data and Descriptive Statistics

5.1 Sample and Survey Implementation

We implemented the experiment over a four-month period between April and July 2019. During this time, members of the survey team attempted to reach 28,958 credit card clients and completed 2,872 phone surveys, implying a 10% response rate.[17] The survey team used the internal records of the partner bank to ensure that respondent phone numbers could be matched to account data. Before commencing the survey, members of the survey team additionally verified the name of the respondent and confirmed that they were the holder of a debit or credit card from our partner bank. Surveys were offered in English and Malay, and 47% of respondents chose to complete the survey in English, while the remaining 53% responded in Malay. Because our survey experiment was integrated in the bank's regular customer outreach program which has no provision for incentivizing respondents, participants were not compensated for their time. Respondents were asked if they wished to participate at the beginning of the interview and could opt out of the survey at any point.[18] The partner bank shared anonymized administrative records for all participants for all survey respondents, as well as for a representative sample of clients who were invited to the survey but did not respond.

Table 2 provides descriptive statistics based on administrative data. Column (1) reports data for a random sample from the universe of the bank's credit card clients, which includes both survey respondents and non-respondents. In this sample, 62% of clients are male, they are on average 33.6 years old, have an average monthly income of $3,087 and monthly credit card expenditures of $1,106. As one might expect, the summary statistics shown in column (1) of Table 2 indicate that clients of the partner bank are not fully representative of the Malaysian population. On the one hand, the age and gender composition of our sample is not substantially different from the country average: data from the Malaysian Department of Statistics for 2020 indicate that 51.4% of the Malaysian population is male (compared to 62% in our sample of bank customers) with a mean age of 31.4 years (compared to 33.6 years in our sample). On the other hand, we find substantial income differences. According to data from the Salaries and Wages Survey Report,[19] the average Malaysian household earned $1,767 (compared to $3,087 in our sample).

However, Table 2 also shows that there is no indication of selection into treatment. Customers who participated in our experiment are similar to non-respondents. Columns (2) and (3) compare the characteristics of the 2,872 clients who answered our survey (reported in column (2)) to the sample of 3,126 clients who were invited to the survey but did not respond (column (3)). Comparing columns (2) and (3) indicates that although there are some statistically significant differences in average char-

[17] This final sample excludes individuals who started the survey but did not make it to the end. There are only 174 partially complete surveys and we cannot reject the hypothesis that respondents are missing at random after the information-provision stage of the survey. Our final sample excludes 274 individuals who reported extreme prior beliefs about the nominal exchange rate (above 4.65 or below 3.7 Ringgit per U.S. dollar) because the system used by the surveyors prevents us from knowing the exact expectations of those respondents. We would have excluded those extreme priors anyway to avoid sensitivity to outliers, as is standard in studies using expectations data (Fuster et al., 2020).

[18] Because the bank released only anonymized data and the research team had no access to personally identified information, informed consent was not obtained from respondents in writing.

[19] Source: Malaysian Department of Statistics, 2017.

acteristics, none of these differences are meaningful in magnitude. For example, the average age is 33.28 years among survey respondents as compared to 33.88 among non-respondents. The average monthly income is $3,128 among survey respondents as compared to $3,049 among non-respondents. The average credit card expenditures are $1,095 among survey respondents and $1,045 among non-respondents. The one possible exception is gender, where we find that men are more represented among survey respondents (67%) than among non-respondents (57%).

Table 3 provides additional descriptive statistics, based on survey and administrative data, and presents a test of randomization balance. Column (1) is based on the sample of all 2,872 survey respondents. The summary statistics show that the respondents in this sample are highly educated (87% have a college degree), around half (54%) are married, and around 10% are self-employed. In columns (2) through (4) of Table 3, we compare the baseline characteristics and expenditures of the three treatment groups. Column (5) reports p-values for the null hypothesis that these characteristics are equal across all three treatment groups. The results indicate that, consistent with successful random assignment, pre-treatment observables are balanced across treatment groups. As expected, all differences across treatment groups are economically small. The difference is statistically significant (p-value=0.09) for only one of the 11 characteristics reported in the table: the number of dependents. This result is within expectations, given that 1 out of every 10 differences are expected to be statistically significant at the 10% level simply by chance. We nonetheless follow standard practice and include the number of dependents as a control variable in all regressions.

5.2 Credit Card Data

Our partner bank shared administrative data on credit card transactions for all customers in the sample. These data allow us to measure spending and borrowing behavior of all customers in our sample for 12 months prior to the intervention and 3 months after the intervention. The dataset contains detailed records of all credit card transactions that occurred during this time period, which include the transaction amount, description, vendor name, and spending category code.[20] The credit card data also include information about outstanding balances and repayment, which we use to measure consumers' willingness to take on debt. Importantly for our purposes, each transaction in the data contains the standardized Merchant Category Code (MCC), a 4-digit identifier that classifies a business by the types of goods or services it sells. The MCC makes it possible to assign each transaction to a specific spending category. Importantly, for the goal of our analysis, the MCC allows us to distinguish between spending on durable, nondurable, tradable, and nontradable goods. To classify spending into durable versus nondurable goods, we follow the standard categorization used in the literature (see Aaronson et al., 2012; Agarwal and Qian, 2014; Ganong and Noel, 2019; Chetty et al., 2020). For example, some durable spending items include apparel, consumer electronics, and furniture. To the best of our knowledge, no other paper has used MCCs to classify credit card spending into tradable and non-tradable expenditures. We therefore created our own categorization by manually inspecting each individual MCC and classifying it as tradable or nontradable. We follow the

[20] We do not obtain data on debit card transactions because that they account for a negligible fraction of spending according to pre-intervention summary data (debit cards are used primarily for cash withdrawals).

standard definition, which identifies a tradable good as a good that can be sold and consumed in a location other than the place where it was produced. In our classification, all codes for services are assigned to the nontradable category, whereas codes for goods are assigned to the tradable category for goods that can be imported or exported. For example, some tradable spending items include apparel and consumer electronics.

We summarize both MCC categorizations in Table 1. As there are thousands of individual MCCs, we report summary statistics using standard groupings of MCCs that are commonly used by financial institutions and in the academic literature. Column (1) reports the average spending for each MCC group in our sample. Column (2) indicates the fraction of spending within that MCC group that is classified as durable (the remainder is classified as nondurable by construction). Column (3) indicates the fraction of spending within the MCC group that is classified as tradable (with the remainder classified as nontradable). For example, the third row corresponds to the MCC group "automotive expenditures", in which 100% of codes are classified as durables and 0% as non-durables, and 64% of the spending in this MCC group is classified as tradable versus 36% as nontradable (primarily codes corresponding to services). The last row of the table summarizes codes that we group as "uncategorized." These miscellaneous MCCs do not contain enough information to categorize them as durable, as opposed to nondurable, or tradable, as opposed to nontradable, expenditures.

Figure 4 summarizes the breakdown of spending between durable and tradable categories. Each rectangle corresponds to one unit of spending. The blue rectangles towards the right, denoted as uncategorized, correspond to the 10% of spending that cannot be categorized. Among the transactions that can be categorized (90% of all spending), 31% are categorized as tradable and the remaining 69% as nontradable. Among the transactions that can be categorized, 32% are durable and 68% nondurable. Figure 4 also shows substantial orthogonal variation between the two categorizations. That is, not all tradables are durables and vice versa.

Table 2 also shows average spending statistics for each key spending category used in our analysis. Specifically, column (2) shows that customers who participated in the experiment used their credit cards to spend average monthly amounts of $364 (33% of the $1,095 total credit card spending) on durables and $272 (25% of total spending) on tradable durables. On average, subjects had $1,801 in outstanding credit card debt, equivalent to 1.5 months of spending.

6 Main Results

6.1 Spending: Survey versus Administrative Data

Existing research has generally studied the impact of economic expectations on consumption using survey data, which may suffer from a number of well-known limitations, such as measurement error, selection problems, and surveyor demand effects. To assess whether this is a source of concern in our study, we explicitly test the relationship between self-reported consumption plans and *actual* future consumption in our data. If survey measures of consumption track actual consumption closely, measuring consumption in administrative data has few benefits. If, however, there is a disconnect between survey responses and actual spending, this would suggest that using administrative data

could be crucially important to avoid spurious results.

Our survey elicited expectations about future credit card spending by asking respondents whether they expect their credit card spending to increase, decrease, or remain the same. Comparing these self-reported consumption plans to actual spending can reveal the extent to which survey measures predict actual consumption. Figure 5 presents the results. The x-axis corresponds to the actual change in monthly credit card spending in the 3 months after the survey completion. The y-axis corresponds to self-reported consumption plans on a 3-point scale from -1 ("go down") to +1 ("go up").

We find a marginally statistically significant (p-value=0.060) relationship between the expected change in credit card expenditures and the actual change in spending, indicating that self-reported consumption plans have some information content. This relationship is, however, weak. The estimated slope (0.040) implies that a one-standard-deviation increase in actual future expenditures is associated with an increase in expected future expenditures of only 0.03 standard deviations.[21] This is also highlighted by a low R-squared of 0.021. These results indicate that survey predictions are a useful but very weak indicator of actual future spending.

There are several possible explanations for this finding. One possibility is that individuals may make consumption decisions spontaneously and are therefore not very good at predicting their spending over longer time horizons. Alternatively, individuals may have a clear idea of their future spending but may fail to follow through on their plans, for example due to a lack of self-control or financial constraints (although the latter is unlikely given that all participants of our experiment have access to credit card borrowing by definition). Another explanation could be measurement error and different types of response bias. Consumers may have a clear idea of their future spending but fail to communicate this accurately in their survey responses. This interpretation is somewhat unlikely to apply in our population, given that the participants of our experiment are highly educated, financially experienced (87% have a College degree) and that we elicited survey expectations following standard questionnaires that were adapted for this specific population.

Taken together, the evidence suggests that using survey data to measure treatment effects may be misleading, and provides a strong rationale for using administrative data to measure actual rather than planned consumption.

6.2 Prior Beliefs

Figure 6 shows the distribution of inflation and exchange rate expectations at baseline. In Figure 6.a, we plot the distribution of prior beliefs about the future inflation rate. Mean (3.39 pp) and median (3 pp) inflation expectations at baseline are fairly close to the expert forecast (2.3 pp) and higher than the most recent observed inflation rate at the time of the experiment (1.4 pp).[22] There is, however, significant dispersion in predictions across individuals, with individuals in the bottom decile of the distribution predicting an inflation rate of 0 pp and individuals in the top decile of the distribution

[21] The standard deviation of the variable shown in the x-axis is $570, and the standard deviation of the variable shown in the y-axis is 0.665.

[22] The 1.4 pp annual rate of inflation corresponds to the estimate for July 2019, and is obtained from the Malaysian Department of Statistics.

predicting an inflation rate of 10 pp. In Figure 6.b, we plot the distribution of exchange rate expectations. The figure shows that beliefs about the future exchange rate follow a similar pattern as those for the future rate of inflation: prior expectations about the nominal exchange rate (4.13 MYR per US$) are centered close to the expert forecast with a mean and median of 4.10 MYR per US$, but there is significant dispersion in individual predictions, with some individuals (bottom 10%) expecting the exchange rate to rise to 3.90 Ringgit per US Dollar and others (top 10%) expecting it to decline to 4.40 Ringgit per U.S. Dollar.

The finding that expectations are centered around the professional forecast but dispersed has been documented widely in the literature on inflation and exchange rate expectations (Armantier et al., 2016; Cavallo et al., 2017), as well as in other contexts (see, for example, Fuster et al., 2020). Our information-provision experiment leverages this dispersion in prior beliefs.

6.3 Effect of Information on Posterior Beliefs

We next examine how the information feedback provided through our treatment conditions affects macroeconomic expectations. To do so, we use the standard econometric approach that has been used in information-provision experiments on a wide range of topics, such as inflation (Armantier et al., 2016; Cavallo et al., 2017), cost of living (Bottan and Perez-Truglia, 2020a), and housing prices (Fuster et al., 2020). We show that agents update their beliefs in response to the information provided in the experiment and find learning rates comparable to those in similar information experiments (see Roth and Wohlfart 2020 for a review).[23]

Let subscript i index the participants of our experiment and denote $\pi_{i,t}^{prior}$ as individual i's prior belief about the inflation rate, where t denotes the point in time when the belief is elicited and π the expected inflation between time t and t + 12 months. This is the belief about the inflation rate right before the individual reaches the information-provision stage of the experiment. Let $\pi_{i,t}^{signal}$ be the value of the signal that we may or may not show to the individual (the expert forecast at time t of the inflation rate in 12 months). Let $T_{i,t}^{\pi}$ be a binary variable that takes the value 1 if individual i is shown the signal and 0 otherwise. We denote the corresponding posterior belief as $\pi_{i,t}^{post}$. That is, the expected inflation rate after the individual sees, or does not see, the signal.

When priors and signals are distributed normally, Bayesian learning implies that after the individual sees the signal, the mean of the posterior belief should be a weighted average between the signal and the mean of the prior belief, $\pi_{i,t}^{post} = \alpha \cdot \pi_{i,t}^{signal} + (1-\alpha) \cdot \pi_{i,t}^{prior}$, where the parameter α depends on the relative precision of the prior belief and the signal (Hoff, 2009). The parameter α, the learning rate, ranges from 0 (individuals ignore the signal) to 1 (individuals fully adjust to the signal). We can rearrange this identity as follows:

$$\pi_{i,t}^{post} - \pi_{i,t}^{prior} = \alpha \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior} \right) \tag{2}$$

In other words, the Bayesian model predicts that the belief updates ($\pi_{i,t}^{post} - \pi_{i,t}^{prior}$) should be a

[23] We find learning rates of .47 and .32 for inflation and exchange rate expectations, respectively. These are close to the median learning rate of information experiments surveyed in Roth and Wohlfart (2020), which range from .08 to .88.

linear function of the gap between the signal and the prior belief ($\pi_{i,t}^{signal} - \pi_{i,t}^{prior}$). That is, respondents who overestimate the inflation rate will revise their expectations downward when shown the signal, and those who underestimate the inflation rate will revise their beliefs upward when shown the signal. The model also predicts that the slope of that relationship should be equal to the learning rate, α.

In practice, several spurious reasons may explain why individuals revise their beliefs in the direction of the feedback, even if they received no signal. For example, some may take additional time to think when asked a question a second time and may get closer to the truth as a result. This may be particularly true in phone surveys where participants interact with a caller and may feel social pressure to report different beliefs when asked about their expectations again, even if they were not given new information. To allay concerns of such potentially spurious updating, we exploit the randomized assignment from the information provision experiment, following standard specifications in the literature (see Armantier et al., 2016; Cavallo et al., 2016):

$$\pi_{i,t}^{post} - \pi_{i,t}^{prior} = \alpha \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi} + \beta \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) + \epsilon_i \tag{3}$$

In this specification, the parameter β picks up spurious reversion towards the signal and α picks up true learning (i.e., changes in beliefs caused by the information provision) above any spurious revisions. Note that we do not expect subjects to fully update to the signal we provided ($\alpha = 1$) because the signal is an expert forecast that most respondents will correctly interpret as uncertain. Moreover, some individuals may not fully trust the source of the forecast and therefore place lower weight on the forecast. Nevertheless, we should expect α to be significantly greater than zero.

The same logic applies to expectations about the nominal exchange rate. Let $d_{i,t}^{prior}$ denote participant i's prior belief about the depreciation rate (i.e., the growth rate of the nominal exchange rate) before the individual reaches the information-provision experiment. Let $d_{i,t}^{signal}$ be the value of the signal that we may or may not show to the individual (i.e., the forecast). Let $T_{i,t}^{d}$ be a binary variable that takes the value 1 if we showed that signal to individual i and 0 if not. Denote $d_{i,t}^{post}$ as the corresponding posterior belief, that is, the expected depreciation rate after the individual sees, or does not see, the signal.

Our experiment provides respondents with information about inflation and the nominal exchange rate. Thus, it is possible that individuals use feedback about the inflation rate to update beliefs about the exchange rate and vice versa. Indeed, we might expect this type of cross-learning based on macroeconomic evidence. For example, after a devaluation of the local currency, there is partial pass-through to inflation (Dornbusch, 1987). We therefore expand the learning model to accommodate the possibility of cross-learning and estimate the following set of equations:

$$\begin{aligned} \pi_{i,t}^{post} - \pi_{i,t}^{prior} = {} & \alpha_1 \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi} + \alpha_2 \cdot \left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d} + \\ & \beta_1 \cdot \left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) + \beta_2 \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) + X_{i,t}\gamma_1 + \epsilon_i \end{aligned} \tag{4}$$

$$d_{i,t}^{post} - d_{i,t}^{prior} = \alpha_3 \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi} + \alpha_4 \cdot \left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d} + \beta_1 \cdot \left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) + \beta_2 \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) + X_{i,t}\gamma_2 + \epsilon_i \quad (5)$$

Note that this equation also includes a vector of control variables denoted $X_{i,t}$. Given random assignment, this vector of control variables should not change the point estimates but it can help absorb the variance of the error term and improve statistical power. We use the exact same set of control variables in all regressions presented in this paper: a set of 10 surveyor dummies, four dummies for the week of the year when the respondent completed the survey, the number of dependents, and 20 variables to control flexibly for the pre-treatment spending patterns.[24]

The main parameters of interest are α_1, measuring how individuals incorporate feedback about inflation into their inflation expectations, and α_4, measuring how individuals incorporate feedback about the exchange rate into their exchange rate expectations. The parameters α_2 and α_3 measure cross-learning by capturing how individuals incorporate exchange rate feedback into their inflation expectations and inflation feedback into their exchange rate expectations.

Before presenting the regression results, Figure 7 provides a graphical summary of the impact of our information treatments on macroeconomic expectations. Figure 7.a shows a binned scatterplot corresponding to the effects of the inflation feedback. The x-axis corresponds to the potential update in response to the provision of feedback (i.e., the difference between the feedback on inflation expectations and the corresponding prior belief). The y-axis shows the actual belief update (i.e., the difference between the posterior belief and the prior belief). The gray circles correspond to the control group (i.e., individuals who do not receive inflation feedback). The slope of this linear relationship (the gray line) corresponds to the coefficient β in the learning equation (3), which measures "spurious" learning. We find significant spurious learning, which is consistent with findings from related studies (see, for example, Fuster et al., 2020; Cullen and Perez-Truglia, 2022).[25] In turn, the red squares correspond to the treatment group (i.e., individuals who receive the inflation feedback). Most importantly, the slope of the relationship is significantly larger (p-value<0.001) in the treatment group (0.472) than in the control group (0.247). This difference in slopes corresponds to the coefficient α from the learning equation (3) (i.e., the true rate of learning that can be attributed to the information provision). Figure 7.b is similar to Figure 7.a, but reports updating on exchange rate expectations instead of inflation expectations. Again, consistent with genuine learning from the feedback, we find that the slope is stronger in the treatment group than in the control group, although the difference is smaller in magnitude (0.317 vs 0.255) and statistical significance (p-value=0.048).

We next turn to the regression results, presented in Table 4. The first two columns of this table

[24] More specifically, we include a set of four variables with the average monthly spending over each of the last four quarters before the survey date, as well as the corresponding set of variables for each of the following spending categories: durable, tradable durable, and nondurable.

[25] In terms of magnitude, however, the degree of spurious learning seems larger in our data. Our preferred interpretation for this difference is that, unlike other surveys experiments that are conducted online, our survey was conducted via phone. As a result, some individuals may have felt pressured to revise their posterior beliefs even if they did not receive any feedback.

correspond to the regression specifications given by equations (4) and (5), respectively. In column (1), the dependent variable is the updating on inflation expectations. In column (2), the dependent variable is the updating on the expected exchange rate depreciation. These results differ from the simpler binned scatterplots in Figure 7 in that they include additional control variables and allow for cross-learning. Table 4 reports the coefficients of the two key independent variables, corresponding to the interactions between the treatment assignments and the size of the information shock. For simplicity, we refer to these variables as information shocks.

The first coefficient from column (1) of Table 4 indicates that information about inflation has a significant effect on inflation expectations: a 1 pp increase in inflation shock increases inflation expectations by 0.236 pp (p-value<0.001). The second coefficient from column (1) of Table 4 is close to zero (-0.030) and statistically insignificant (p-value=0.189), indicating that the information shock about the exchange rate does not have a significant effect on inflation expectations. In other words, individuals use the feedback in a compartmentalized manner.

The magnitude of the pass-through from the inflation feedback to the inflation expectations is in the same order of magnitude as the pass-through estimated in other information experiments. For example, Bottan and Perez-Truglia (2020a) shows that a 1 pp increase in feedback about future home prices increases the home price expectations by 0.205 pp. However, the degree to which subjects incorporate the information is lower than that reported in other studies. For example, Cavallo et al. (2017) find that, when forming inflation expectations, the average Argentine respondent assigns a weight of 0.432 to the feedback and the remaining 0.568 to their prior beliefs (coefficient α-statistics reported in Panel B, column (1) of Table 1). The fact that individuals are less prone to incorporating information in our context may reflect a more educated and financially savvy population that has more confidence in their prior beliefs. However, this difference in rates of learning could be attributed to differences in the survey methods. For example, other studies provide information and elicit beliefs on a computer screen, whereas our study uses phone surveys, which could arguably make the information less salient. Also, other studies where subjects are paid to fill out the survey could generate experimenter demand effects. Subjects in our survey were not paid for their participation.

The second coefficient in Table 4, column (2), indicates that information about the exchange rate has a significant effect on exchange rate expectations: a 1 pp information shock increases expectations of a nominal exchange rate depreciation by about 0.064 pp (p-value=0.038). Again, we find compartmentalized learning about the exchange rate: the first coefficient in column (1) is close to zero (0.032) and statistically insignificant (p-value=0.214), indicating that information about the inflation rate does not have a significant effect on participants' exchange rate expectations. We find that the magnitude of the learning effects for the exchange rate (coefficient of 0.064) is lower than the magnitude of learning effects for inflation (0.236), and the difference between the two is statistically significant (p-value<0.001). Following a Bayesian learning approach, we offer two potential interpretations for this difference. First, individuals may have stronger prior beliefs about the exchange rate than about the inflation rate. This interpretation is consistent with the evidence documented in Section 3.1 showing substantially more interest in learning about the exchange rate than the rate of inflation, presumably because it is more consequential for everyday economic decisions. An alterna-

tive interpretation is that individuals do not trust the precision of the signal. That is, they are less likely to trust expert forecasts about inflation than about the exchange rate. However, as we do not provide specific information about the sources of inflation and exchange rate forecasts used in our experiment, this interpretation seems less likely.

6.4 Effect of Information on Spending

Having shown that our information treatments are effective at shifting beliefs, we turn to their impacts on consumption. The main goal of our experiment is to test whether changes in macroeconomic expectations affect actual spending, as measured in administrative data covering the universe of credit card transactions for bank customers in our sample. To examine this question, we estimate the following regression equation:

$$\begin{aligned} Y_{i,t+1} &= \alpha_Y^{\pi} \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi} + \alpha_Y^{d} \cdot \left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d} + \\ &\beta_Y^{\pi} \cdot \left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) + \beta_Y^{d} \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) + X_{i,t}\gamma_Y + \epsilon_i \end{aligned} \tag{6}$$

Note that the right-hand-side of equation (6) is identical to the learning equations in (4) and (5). The only difference is that the dependent variable is now a generic outcome $Y_{i,t+1}$. For example, this dependent variable may be the average monthly spending in the 3 months post-treatment. Recall that in the set of control variables ($X_{i,t}$), we include the pre-treatment spending, which exploits the persistence in spending patterns to help reduce the variance of the error term and improve statistical power (see McKenzie, 2012).

Table 4 reports the results. In columns (1) and (2), we estimate the relationship between the information shock and the resulting change in self-reported macroeconomic expectations. The results confirm that participants update their macroeconomic expectations in response to the information provided to them through our experiment. In Table 4, columns (3) through (6), we use the same empirical specification to examine whether the changes in macroeconomic expectations documented in columns (1) and (2) translate into changes in consumption behavior. To do so, we estimate equation (6), with spending on durables, tradable durables, credit card debt, and total spending as the respective outcomes. Each outcome is measured in the administrative data obtained from our partner bank. We observe credit card spending for 3 months after the intervention and average the monthly spending over the entire period to mitigate concerns about outliers or seasonality of expenditures. Total credit card debt is the amount of debt outstanding after the monthly repayment due date.

The results in columns (3) through (5) of Table 4 test the key predictions of the theoretical framework presented in Section 2. The first coefficient in column (3) measures the effect of the inflation shock on durables consumption. This is a direct test of Proposition 1, which states that spending on durables should increase with expected inflation. We do not find support for this prediction in the data. While the point estimate has the correct sign, the coefficient is small in magnitude (1.646) and not statistically different from 0 (p-value=0.556). The information shock delivered by our experiment moves inflation expectations by an average of 0.088 standard deviations, but our estimate implies that

it increases average monthly spending on durables by only 0.005 standard deviations (or less than $2).

Similarly, the second coefficient estimate in column (4) of Table 4 provides a test of Proposition 2, which states that a decrease in the expected exchange rate (an increase in the expected rate of depreciation) should increase spending on tradable durables. We also do not find evidence consistent with this prediction. The point estimate is negative, small in magnitude (-2.514), and not statistically significant (p-value= 0.196). While our intervention moves exchange rate expectations by an average of 0.023 standard deviations, this coefficient estimate implies a negligible impact on spending on tradable durables, shifting expenditures in this category by only 0.01 standard deviations.

Finally, column (5) of Table 4 shows that, consistent with Proposition 3, an increase in the expected inflation rate leads to a slight increase in total credit card debt. However, this coefficient is statistically insignificant and small in magnitude: it implies that for each 1 pp increase in the inflation shock, individual credit card debt increases by just 0.013 standard deviations.

In column (6), we consider an additional hypothesis that is not motivated by intertemporal consumption models. As argued by Coibion et al. (2019), individuals may see future inflation and exchange rate depreciation as signs of a weak economy. According to that view, an increase in expected inflation and depreciation may discourage the individual from spending in general, for precautionary reasons. To explore this additional hypothesis, column (6) of Table 4 uses total spending as the dependent variable. We do not find any evidence that inflation and exchange expectation shocks have significant effects on total spending. The coefficients are negative but economically small and statistically insignificant. For example, a 1 pp inflation shock reduces total spending by just 0.002 standard deviations (p-value=0.776), while a 1 pp depreciation shock reduces total spending by just 0.005 standard deviations (p-value=0.480).

As an additional robustness test to check the regression specification, we leverage data on pre-treatment spending, which allows us to conduct a falsification test in the spirit of an event-study analysis. We estimate the same regression but use pre-treatment instead of post-treatment spending as the dependent variables. The outcomes are measured before participants receive information and thus should not show effects of the information on pre-treatment spending. Appendix C.1 presents the results. As expected, we find no effects of the information shocks on pre-treatment spending outcomes.

6.5 Magnitude of Coefficients

In the previous section, we show that our information treatments shift expectations but do not have a statistically significant effect on consumption. However, this does not necessarily mean that the effects are precisely zero. To get a better quantitative sense of the effect sizes, we take a hypothetical information shock of 1 pp and estimate its impact on the outcomes of interest in terms of dollars and standard deviations. We first consider the effect of an inflation shock on durable consumption and find that a 1 pp information shock is predicted to increase durable spending by a statistically insignificant $1.646, equivalent to less than 0.005 standard deviations of the corresponding outcome. To examine the possibility of an undetected increase in durable spending, we inspect the confidence interval of our estimate. The upper bound of the 95% confidence interval is approximately 7.12, which

rules out positive effects larger than $7.12. Relative to the standard deviation of the outcome variable, we can rule out effects above 0.021 standard deviations, which is very close to zero.

Note that our estimates are intention-to-treat (ITT) effects, because the information shock given to the subjects only partially translates into changes in their posterior beliefs. For this reason, we refer to equation (6) as the reduced-form effects of the information experiment. For a more direct measure of the effect of expectations on behavior, we can use an instrumental variables version of the reduced-form equation but with two endogenous variables corresponding to the belief updates for inflation and exchange rate expectations.

We report the results from the instrumental variables regressions in Table 5. The first prediction of interest is that an increase in inflation expectations should increase durable expending. The coefficient on inflation expectations in Table 5, column (1), indicates that a 1 pp increase in inflation expectations causes an increase in durable spending of $13.4, or only 0.039 standard deviations for this outcome. Looking at the upper bound of the 95% confidence interval, we rule out an increase in this outcome above $38.5, or 0.11 standard deviations. This suggests that, while we cannot rule out that inflation expectations have small effects on spending behavior, we can rule out moderate to large effects.

The results are similar for other hypotheses that we tested. The second prediction of our theoretical framework is that an increase in expected depreciation should increase spending on tradable durables. Contrary to this prediction, the coefficient from column (2) indicates that a 1 pp increase in the expected devaluation reduces rather than increases spending on tradable durables by $34.4, which is equivalent to a reduction of 0.138 standard deviations. Inspecting the bounds of the 95% confidence interval, we rule out an increase of more than 0.116 standard deviations for this outcome. The third prediction of the theoretical framework is that an increase in inflation expectations should increase credit card borrowing. The coefficient from column (3) indicates that a 1 pp increase in expected inflation increases credit card debt by only $31.7, which is equivalent to 0.042 standard deviations. Moreover, the 95% confidence interval rules out positive effects of more than 0.122 standard deviations. Last, column (4) shows the effects of expectations on total spending. The results indicate that a 1 pp increase in inflation expectations increases total spending by $1.54, or 0.002 standard deviations. In turn, a 1 pp increase in depreciation expectations decreases total spending by $64.3, or 0.071 standard deviations.

These results involve tests of multiple related predictions, involving multiple combinations of expectations and spending margins. The small and statistically insignificant coefficients across the board suggest that while expectations may have some effect on spending behavior, those effects appear to be very small and therefore difficult to detect. As an additional test to rule out the presence of economically meaningful effects, we estimate the relationship between expectations and credit card spending using the full variation in expectations, rather than restricting our attention to the exogenous variation generated by our experiment. Table 6 presents the results. The results reported in the table correspond to the ordinary least squares equivalent of the instrumental variable regressions reported in Table 5. There is a simple trade-off between these two approaches. On the one hand, the experimental estimates provide better identification of the causal relationship between expectations and consumption. On the other hand, the OLS estimates exploit all available variation in expectations

and thus lead to substantially more precisely estimated coefficients.

The results from the two approaches are qualitatively consistent: the estimated effects of expectations on behavior are close to zero and statistically insignificant. However, the OLS estimates from Table 6 are substantially more precisely estimated than the corresponding IV estimates from Table 5. As a result, the non-experimental estimates can rule out even smaller effects. Take for example the effect of inflation expectations on durable consumption. According to the coefficient from column (1) of Table 6, a 1 pp increase in inflation expectations is associated with a reduction in durable expenditures of less than $2. If we take the upper bound of the 95% confidence interval, we can rule out increases in durable expenditures above $2.01, which is equivalent to 0.002 standard deviations of that outcome and thus an arguably negligible effect. In summary, both experimental and non-experimental data support the conclusion that our estimates provide evidence of null or small effects of macroeconomic expectations on spending behavior.

6.6 Mechanisms: What Explains the Absence of a Spending Response?

There are several potential mechanisms that might explain why the significant changes in macroeconomic expectations, induced by the information experiment, do not translate into changes in credit card spending matching those of a standard model of intertemporal consumer choice. In this section, we present additional tests and results from a follow-up survey experiment to explore which of these mechanisms are most consistent with the pattern of our results.

The "mental model" experiment. We conduct an additional mental model survey experiment to test several candidate mechanisms that might explain the absence of a spending response in our main experiment. This follow-up experiment is similar to our main information intervention, but designed to elicit responses to different exchange rate and inflation scenarios while also randomizing whether expected nominal income is held constant and eliciting several measures of respondents' financial sophistication. In the first step of the experiment, we elicit each participant i's prior beliefs about inflation θ_i^{π} or the exchange rate θ_i^{d}, using the same approach as in our main experiment. In the second step, we randomly assigned respondents to one of four inflation or exchange rate depreciation scenarios. The scenarios presented to respondents are defined in reference to their prior beliefs. Specifically, respondents are asked to consider a scenario in which the realized inflation or exchange rate depreciation is $\theta_i^{\pi,d} + \Delta x_i^k$ and the randomly assigned percentage change takes one of the values $\Delta x_i^k \in \{-10, -3, 3, 10\}$. We ask participants about their spending response and elicit demand for inflation and exchange rate indexed securities in each scenario. Finally, we included a brief survey measuring basic indicators of financial literacy.[26] We combine evidence from the mental model exercise with results from our main experiment to test alternative mechanisms that might explain the absence of a spending response to changes in macroeconomic expectations.

Time inconsistency. Before turning to the results of the mental model exercise, we explore two mechanisms that can be tested with data from the main experiment. First, one possible explanation for the absence of a spending response is that individuals update their *intended* behavior but cannot

[26] We find that, overall, financial literacy in our study population is relatively high. For example, 58.5% percent of respondents are able to answer at least two of the standard "big three" financial literacy questions correctly.

follow through on their consumption plans, for example due to self-control problems or liquidity constraints. Since our survey collected data on spending plans, we can test this hypothesis directly. We estimate equation (6) using self-reported spending plans measured post-treatment as the dependent variable, rather than actual spending observed in the credit card data.

The results show that individuals do not change their self-reported spending plans in response to new information about inflation or the exchange rate, as shown in Table 7. For reference, columns (1) and (2) reproduce the treatment effects of information shocks on the inflation and exchange rate expectations. In columns (3) through (6), we report the results of estimating equation (6) using self-reported spending plans for the four specific sub-categories of spending. Each of these outcomes is measured on a three-point scale that takes the values -1 (if the respondent anticipates spending less in the future), 0 (if they anticipate spending about the same), or +1 (if they anticipate spending more). Each outcome in columns (3) to (6) of Table 7 corresponds to the survey equivalents of the consumption behavior measured with administrative data in columns (3) to (6) of Table 4. In column (3), the dependent variable is the stated intention to increase or decrease spending on durable goods. The prediction from the macroeconomic model is that higher inflation expectations should increase intended spending on durables.

We find no evidence of such an effect. The impact of increased inflation expectations on total consumption is close to zero (-0.006), statistically insignificant and small in magnitude: a 1 pp inflation shock is associated with a reduction in expected durable spending of only 0.001 standard deviations. In column (4), the dependent variable is intended future spending on electronic goods, which is our survey proxy for durable tradables. These estimates test the prediction that expected depreciation should result in an increase in planned spending on durable tradables. Contrary to this prediction, the coefficient on the exchange rate shock is close to zero (0.008) and statistically insignificant. In column (5), the dependent variable is the expected change in borrowing. The theoretical prediction is that an increase in inflation expectations will lead to higher expected borrowing. We do not find support for this hypothesis. The coefficient on inflation shock is close to zero (-0.003) and statistically insignificant. In column (6), the dependent variable is the intention to increase total spending. This regression tests the hypothesis that expectations of inflation or exchange rate depreciation may be interpreted as a sign of an overall economic slowdown and should therefore lead to a decline in spending. Instead, we find that the coefficients on the inflation shock and the exchange rate shock are both close to zero (-0.006 and 0.003) and statistically insignificant.

Transaction amounts. It is also possible that changes in macroeconomic expectations are not reflected in credit card spending because macroeconomic considerations are not sufficiently salient when consumers make small purchases and only enter consumers' decision making in the case of large purchases. We test this mechanism using data from the main experiment and disaggregating consumers' credit card transactions by amount and type of transaction and estimating treatment effects separately for large and small purchases.

To implement this, we first use administrative data on credit card purchases in the pre-treatment period and construct an indicator variable for transactions in the top quartile (large transactions) and the bottom quartile (small transactions) of the pre-treatment distribution of credit card purchases.

We then apply the cutoffs from the pre-treatment distribution to identify large and small purchases in the post-treatment data and estimate separate treatment effects for large and small transactions, using our standard specification. In all regressions, we normalize the spending variables to avoid bias due to the inherent difference in transaction sizes between the top and bottom quartiles of the distribution. Intuitively, if the lack of a spending response to updated macroeconomic expectations is due to insufficient salience of macroeconomic considerations in small transactions, one would expect anticipated inflation or currency depreciation to have no effect on small purchases but affect spending for larger purchases. Table 8 presents the results. We find that the treatment effects are overall close to zero and not statistically different between the small and large purchase categories.

As an additional test, Table C.2 in the Supplementary Appendix uses a different classification of large and small purchases based on the credit card spending categories in the administrative data that have the largest average transaction sizes. In Table C.2, we compare the treatment effect for the three categories with the largest median transaction size to the treatment effect for the three categories with the smallest median transaction sizes. We find that, again there is no economically or statistically significant difference in the treatment effect between categories with large and small transaction amounts. Taken together, this suggests that insufficient salience of macroeconomic considerations in small transactions is not the mechanism that can explain the absence of a spending effect in response to revised macroeconomic expectations.

Impact of information over time. In addition to transaction amounts, another possibility that could explain the absence of a spending response could be that the impacts of the information treatment are not sufficiently long lasting to affect consumption choices. While we cannot test this possibility directly, growing evidence in similar settings indicates that participants retain information provided in the context of an information treatment for months after the experiment (see Cavallo et al., 2017; Bottan and Perez-Truglia, 2020a) or even a year later. This suggests that it is unlikely that participants in our experiment simply discard the acquired information when making consumption decisions.Another result that is inconsistent with the information treatments not being long-lasting enough is that the treatment effects we find in the main experiment are not zero across the board, we do find significant reductions in expenditures on durable goods, for example. While the sign of the effects is inconsistent with a standard model of intertemporal consumer choice, the presence of an effect suggests that the information provided in our experiment *did* affect some dimensions of consumer choice at a longer time horizon.

Consumer sophistication. Another mechanism that could explain the absence of a spending response is the possibility that agents fail to optimize due to limited financial sophistication or financial literacy, a pattern that has been documented in many similar household finance settings (Campbell et al. 2011; Beshears et al. 2018; Ponce et al. 2017). Specifically, in the context of our experiment it is possible that consumers change their expectations in response to expert forecasts, but simply do not know how to respond optimally to changes in inflation or the exchange rate.

We examine this mechanism using a series of tests based on standard measures of financial literacy we collected as part of the mental model experiment. In the first test, we elicit a simple measure of financial literacy using the standard "big three" financial literacy questions and examine whether

responses to the inflation and exchange rate scenarios presented in the mental model experiment differ systematically for more financially literate respondents. Specifically, we split the sample of the mental model experiment into high financial literacy (above median) and low financial literacy (below median) respondents and compare their responses to the randomly assigned inflation and exchange rate scenarios using within-person variation.

Table 9, Panel A, first confirms that the reaction to anticipated changes in inflation and the exchange rate matches that of our main experiment. Table 9, Panel B, reports the results separately for respondents with high and low financial literacy. Interestingly, we find that the negative effects of the high inflation and exchange rate depreciation scenarios on durable consumption, which point toward the anticipation of nominal rigidities, appear to be driven *entirely* by the more financially literate respondents in our sample. This indicates that, rather than limited financial literacy explaining the lack of transmission from expectations to actual spending, it is the most financially literate consumers who reduce durable spending in a way that counteracts the predictions of a standard model of intertemporal choice. This is arguably because the more sophisticated consumers in our sample understand that their income is not indexed to inflation or the exchange rate and they correctly anticipate their real income to decline in the high inflation or exchange rate depreciation scenario.

Nominal rigidities. To provide a more direct test of the hypothesis that consumers are sophisticated enough to anticipate nominal rigidities, we examine whether customers with large updates in inflation and exchange rate beliefs have demand for inflation indexed or exchange rate indexed securities. In one arm of the mental model experiment, participants were presented with an hypothetical asset indexed to either inflation or the exchange rate and asked whether they would be interested in buying this asset. The results, reported in Table 10, show that consumers with large updates in their inflation and exchange rate expectations have substantially higher demand for the indexed asset, both in the simple updating experiment and when they are additionally assigned to receive the fixed income script. The fact that demand for indexed securities is not reduced by the fixed income condition provides additional suggestive evidence in favor of the hypothesis that consumers reduce spending in anticipation of nominal rigidities. This result resonates with the hypothesis, proposed in Christiano et al. (1999), that when making consumption decisions, consumers care about the wage Philipps curve rather than the price Phillips Curve. It is also consistent with recent work that finds a low passthrough from inflation expectations to income growth expectations (see Hajdini et al., 2022).

Overall, the results suggest that the lack of a spending response to information shock cannot be explained by a lack of consumer sophistication. On the contrary, consumers are sophisticated enough to associate exchange rate depreciations and inflation with a decline in real income and reduce spending for precautionary reasons, which attenuates the possibility of a positive spending response to higher expected inflation and exchange rate depreciations.

In summary, the pattern of results suggests that the absence of a spending response to changed macroeconomic expectations is not the result of an anticipated worsening in the overall economic situation, time inconsistency, lack of financial literacy, insufficient salience of macroeconomic considerations. Instead, the results suggest that consumers are sophisticated enough to anticipate nominal rigidities that will erode the purchasing power of their non-indexed income and reduce their

consumption of durable goods for precautionary reasons. This counteracts the spending effects predicted by standard models of intertemporal optimization and contributes to the absence of an overall credit card spending response to revised macroeconomic expectations that matches the predictions of a standard model of intertemporal consumer choice.

7 Conclusion

How do macroeconomic expectations affect individual consumption decisions? To explore this question, we conducted a field experiment with 2,872 credit card customers of a large commercial bank. We created exogenous variation in macroeconomic expectations through an information-provision experiment in which participants were provided with expert forecasts of inflation and the exchange rate. We then measure the effects of these information shocks on consumers' subsequent macroeconomic expectations, self-reported spending plans (measured in survey data), and *actual* spending (measured in administrative data). We test several predictions from a standard model of intertemporal consumer choice, such as whether an increase in inflation expectations increases spending on durables. We find that information provision shifts beliefs but does not change consumers' actual spending behavior as predicted by these models.

We test several mechanisms that could explain the absence of a spending response to the significant changes in macroeconomic expectations induced by our experiment. We show that consumers do not fail to optimize because of limited financial sophistication or behavioral factors, such as time inconsistency, commitment problems, or mistaken beliefs about the link between inflation, exchange rates and the state of the overall economy. Instead, the interpretation most consistent with our findings is that consumers correctly anticipate nominal rigidities and reduce expenditures, especially on durable goods, for precautionary reasons. This counteracts the effects predicted by standard models of intertemporal optimization and accounts for the absence of a spending response.

These results have direct implications for the transmission of macroeconomic policy. Many macroeconomic policies are explicitly based on the premise that changes in economic expectations will affect households' consumption choices. For example, central banks may try to engineer higher inflation expectations to stimulate spending (Bachmann et al., 2015), or they may try to manipulate expectations about the exchange rate to affect the consumption of foreign goods. Our results suggest that such policies might be ineffective, or at least less effective than previously believed, because consumers do not factor macroeconomic expectations into their consumption decisions in the manner predicted by standard economic models.

Our results also highlight the important role of consumer heterogeneity in the transmission of economic expectations to the real economy. We find that even within the relatively homogeneous population of our experiment, precautionary consumption reductions in response to updated inflation or exchange rate expectations are concentrated among more financially literate respondents. This is in line with the widely documented disagreement on macroeconomic expectations among households (Andre et al., 2022) and further complicates the task of predicting the aggregate effects of macroeconomic polices such as forward guidance on the real economy.

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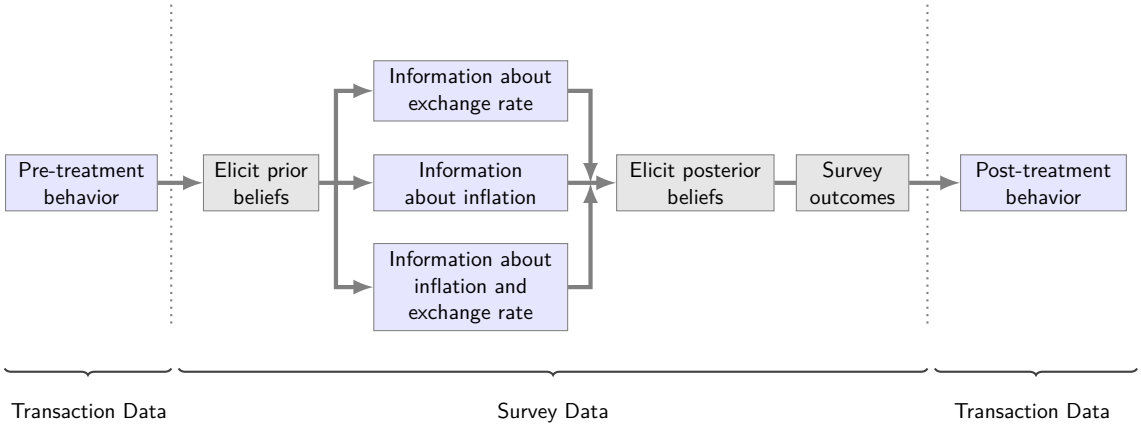
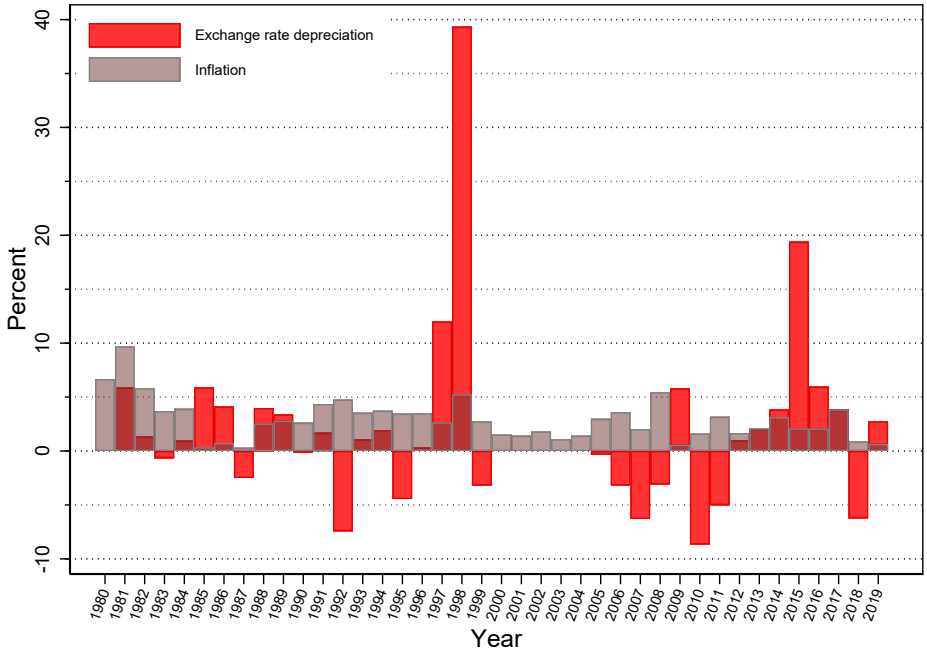
Figure 1: Experimental Design



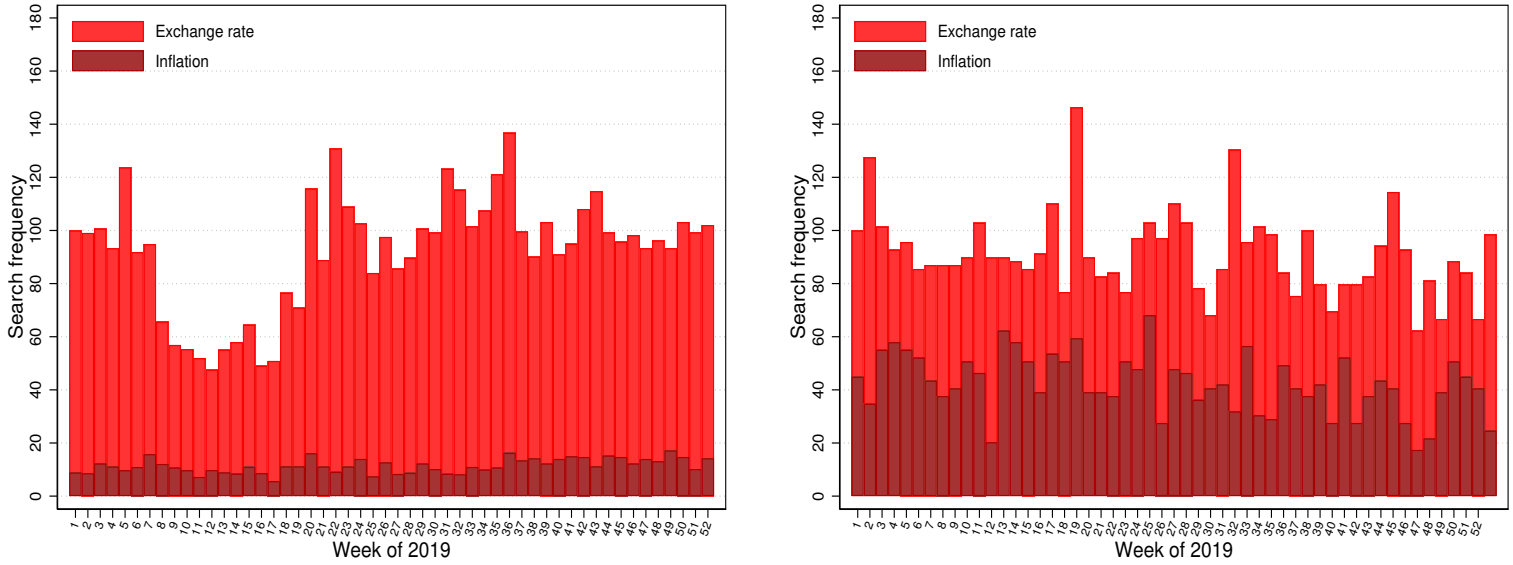
Notes: The figure summarizes the treatment conditions and timeline.

Figure 2: Inflation and Nominal Exchange Rate 1980-2019



Notes: The figure shows the time series of the annual inflation rate and the time series of changes in the nominal exchange rate of the Malaysian Ringgit against the U.S. Dollar for the period 1980-2019. Source: Federal Reserve Bank of St. Louis.

Figure 3: Public Interest in Inflation and the Exchange Rate

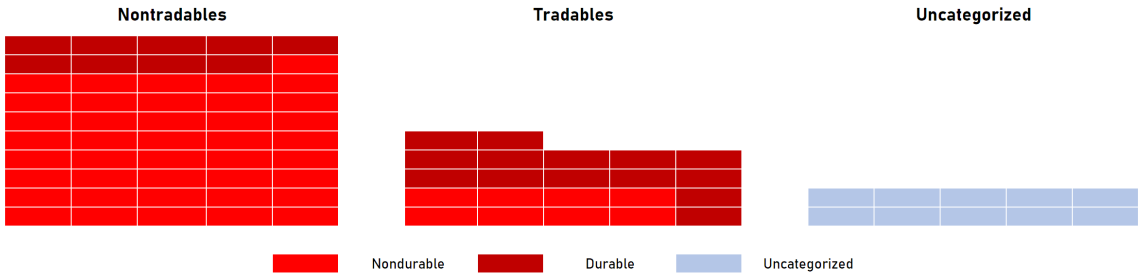


(a) Google Searches

(b) Newspaper Articles

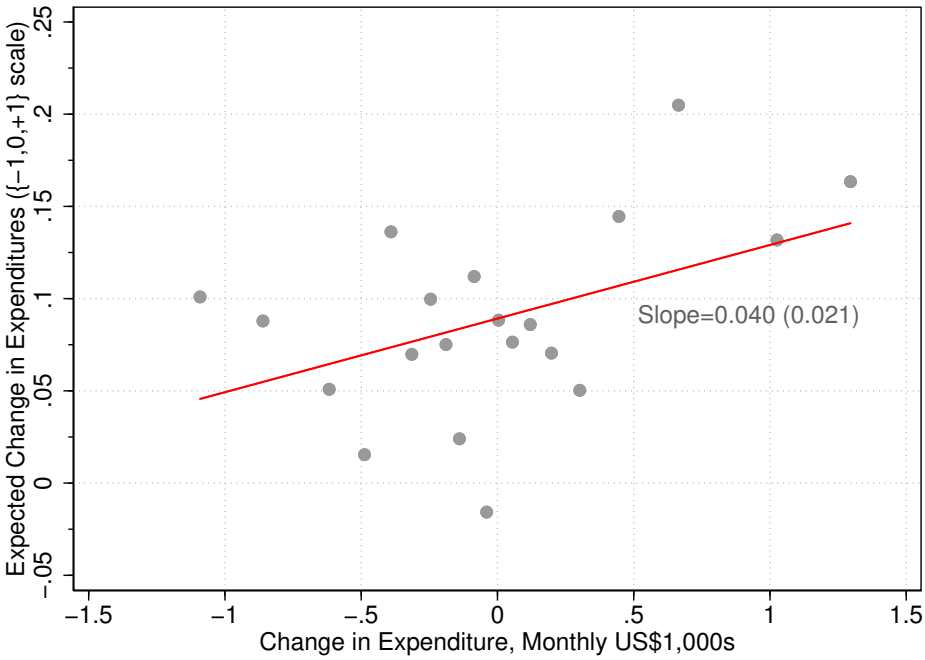
Notes: The figure shows descriptive statistics on public interest in inflation and the nominal exchange rate. Panel (a) shows the frequency of Google searches for the terms "inflation" and "dollar" in English and Malay between January and December 2019. Data on Google searches is reported only in relative terms with reference to a numeraire category. We therefore normalize the series so that exchange rate searches in the first week of 2019 are equal to 100. Panel (b) shows the frequency of articles containing the terms "inflation" and "dollar" in the country's most widely read English language newspaper between January and December 2019 (100=70 articles).

Figure 4: Expenditures by Category



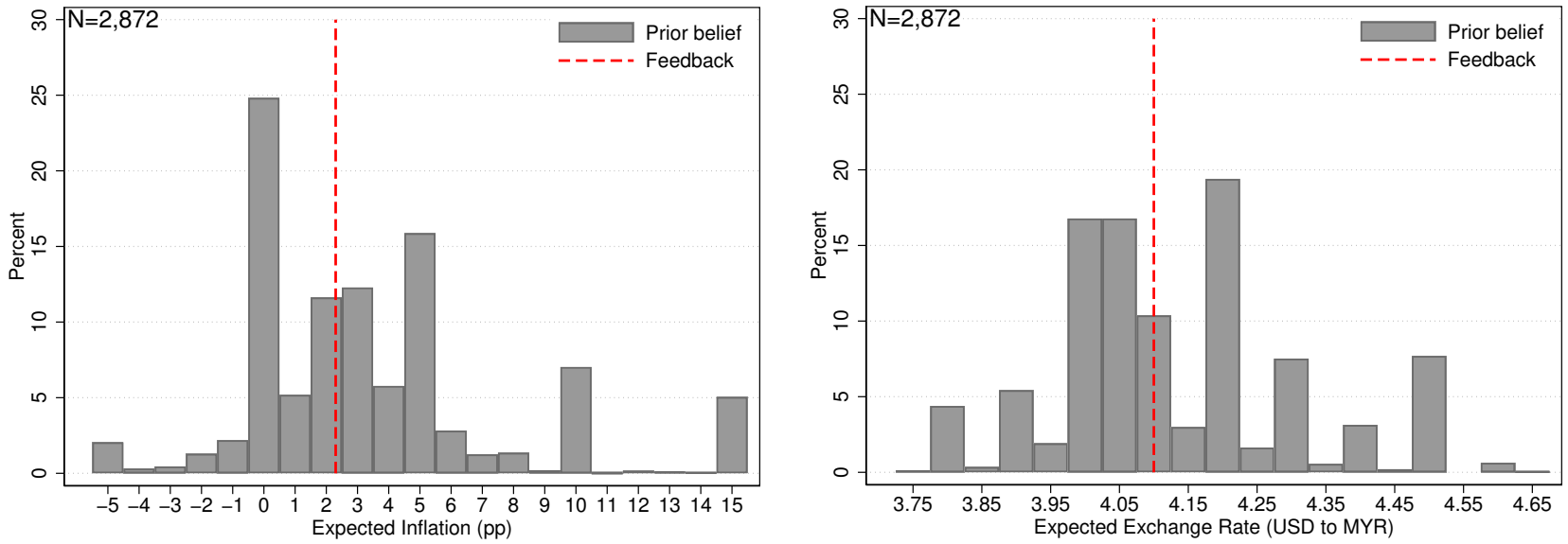
Notes: Each of the 82 squares in the figure represent $\frac{1}{82}$ of the total spending in the credit card data. The leftmost group of squares corresponds to spending on nontradable goods, the middle group corresponds to spending on tradables, the rightmost group corresponds to spending that cannot be categorized. The leftmost and middle groups are subdivided into nondurable spending and durable spending. All expenditures were categorized based on MCCs. For additional details, see Table 1.

Figure 5: Self-Reported Spending Plans versus Actual Spending



Notes: The figure shows the relationship between the actual change in credit card expenditures, measured in administrative data, and self-reported spending plans, based on survey data. The regression controls for surveyor and week fixed effects. Expenditure in administrative data is measured as the difference in average monthly expenditure across three months post-treatment (the post-survey period for which data is available) and average monthly expenditure for the twelve months pre-treatment (the pre-survey period for which data is available). The predicted change in expenditure corresponds to survey responses on planned credit card expenditure, recorded as 1 if a respondent expects to spend more, 0 if they expect to spend about the same, and -1 if they expect to spend less. 'Slope' is the OLS coefficient of the relationship, with robust standard errors in parentheses.

Figure 6: Distribution of Prior Expectations

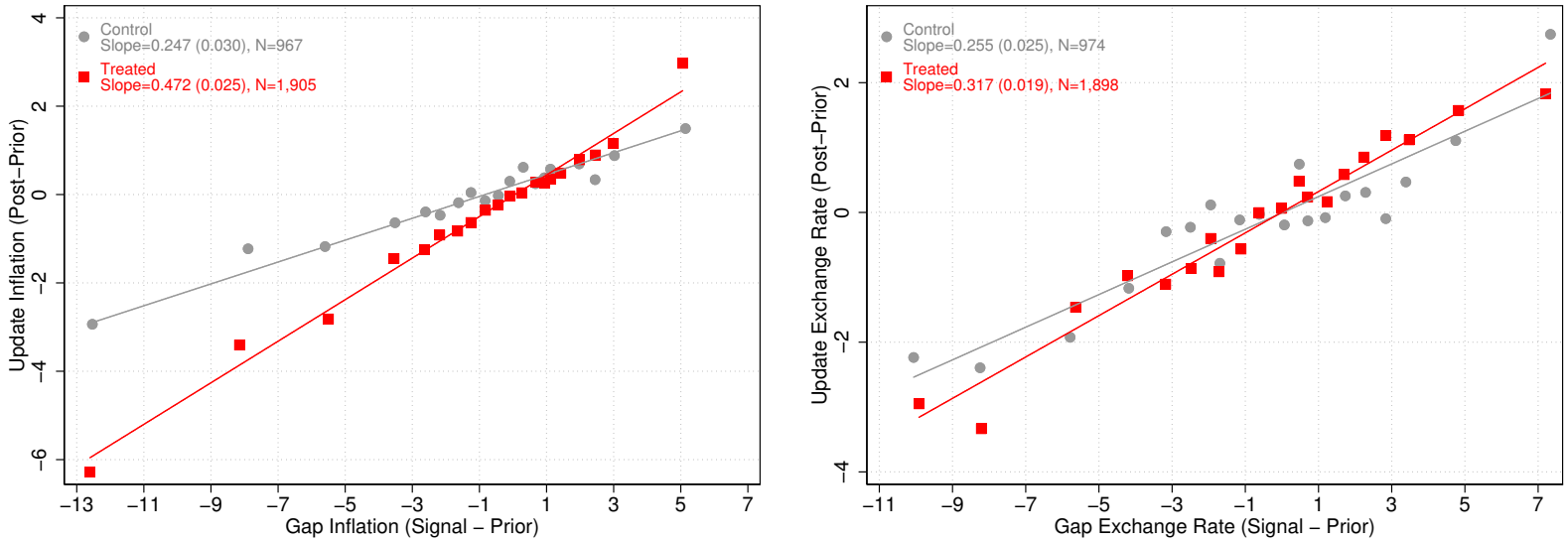


(a) Inflation Priors

(b) Exchange Rate Priors

Notes: The figure shows the distribution of prior beliefs about future inflation in panel (a) and the future nominal exchange rate in panel (b), elicited prior to the information experiment for all survey respondents. Dashed vertical lines correspond to the feedback on the future inflation and exchange rate subsequently provided through our intervention. The mean (median) of inflation expectations is 3.39 pp (3 pp). The mean (median) of exchange rate expectations is 4.1 MYR/US$ (4.1 MYR/US$).

Figure 7: Belief Updating



(a) Inflation Expectations

(b) Exchange Rate Expectations

Notes: The figure shows the relationship between information shocks provided and changes in inflation expectations in panel (a), and information shocks provided and exchange rate expectations in panel (b). The x-axis in panel (a) plots the gap between the inflation signal shown to respondents and their prior inflation expectations $\pi_{i,t}^{signal} - \pi_{i,t}^{prior}$, while the y-axis plots the difference between prior and posterior inflation expectations $\pi_{i,t}^{post} - \pi_{i,t}^{prior}$. The x-axis in panel (b) plots the gap between the exchange rate signal shown to respondents and their prior exchange rate expectations $d_{i,t}^{signal} - d_{i,t}^{prior}$, while the y-axis plots the difference between prior and posterior exchange rate expectations $d_{i,t}^{post} - d_{i,t}^{prior}$. In panel (a), treatment and control groups denote whether the subject was chosen to receive feedback about the inflation rate or not. In panel (b), treatment and control groups denote whether the subject was chosen to receive feedback about the exchange rate or not. The analysis controls for number of dependents, week fixed effects, surveyors fixed effects, and 20 additional variables controlling for spending patterns during the four pre-treatment quarters.

Table 1: Durable and Tradable Expenditures

	Average monthly expenditure, USD	Durables (%)	Tradables (%)
	(1)	(2)	(3)
Airline and Travel	78	0	0
Apparel	30	100	100
Automotive	43	100	64
Books and Stationery	5	100	100
Business Service	47	0	0
Camera and Photo	2	33	33
Car Rental	2	0	0
Computer Equipment	13	100	100
Department Store	40	100	100
Dept Store	34	100	100
Dining	66	0	0
Direct marketing	39	0	0
Education	9	100	0
Electronics	28	100	66
Entertainment	6	0	0
Financial services	21	0	0
Food and beverage	61	0	0
Furniture	21	100	66
Government	21	0	0
Groceries	58	0	0
Health and beauty	30	0	50
Home improvement	17	100	60
Hotel	2	0	0
Insurance	20	0	0
Jewellery and watches	17	100	100
Medical and optical	38	100	16
Music store	3	0	100
Others	13	0	7
Petrol	95	0	100
Retail	28	0	0
Sporting store	8	100	100
Telecommunications	52	100	33
Toys	3	100	100
Utilities	23	0	0
Uncategorized	137	–	–

Notes: The table shows average monthly credit card spending by Merchant Category Code (MCC) groups, and the classification of MCC groups according to whether they are tradable or durable. Column (1) shows monthly spending by category. Columns (2) and (3) report the share of purchases in each category that are classified as durable and tradable goods, respectively.

Table 2: Summary Statistics for Participants and Non-Participants

	All	Responded to survey		p-value
		Yes	No	
	(1)	(2)	(3)	(4)
Panel A: demographics				
Male	0.62	0.67	0.57	0.000
	(0.01)	(0.01)	(0.01)	
Age	33.59	33.28	33.88	0.001
	(0.09)	(0.13)	(0.13)	
Monthly income	3,087	3,128	3,049	0.113
	(24.97)	(34.28)	(36.09)	
Panel B: monthly expenditures, pre–treatment				
Total	1,069.44	1,095.09	1,045.89	0.265
	(22.27)	(28.06)	(34.08)	
Durables	343.20	364.20	323.91	0.015
	(8.19)	(13.47)	(9.69)	
Tradable durables	259.34	271.88	247.83	0.098
	(7.16)	(11.87)	(8.35)	
Debt balance	1,805.97	1,800.84	1,810.67	0.895
	(37.71)	(47.49)	(57.72)	
Observations	6,000	2,872	3,128	

Notes: The table reports summary statistics on survey respondents and non-respondents. Panel A reports demographic characteristics, based on the bank's administrative data. Panel B reports summary statistics on pre-treatment spending, based on average monthly credit card spending in the 12 months prior to the experiment. Column (1) reports summary statistics for the full sample, column (2) reports summary statistics for credit card customers who participated in the experiment and column (3) reports statistics for customers that we attempted to contact, but who did not participate in the experiment. Column (4) reports p-values for a test for equality of means between the group of survey respondents and non-respondents. Robust standard errors of the mean in parentheses.

Table 3: Test of Randomization Balance

	All	Treatment			
		Exchange Rate	Inflation Rate	Both	p-value
	(1)	(2)	(3)	(4)	(5)
Panel A: demographics					
College	0.87	0.86	0.87	0.86	0.36
	(0.01)	(0.01)	(0.01)	(0.01)	
Married	0.54	0.53	0.54	0.52	0.19
	(0.01)	(0.01)	(0.01)	(0.02)	
Number of dependents	0.86	0.82	0.87	0.82	0.09
	(0.02)	(0.03)	(0.03)	(0.04)	
Self-employed	0.10	0.09	0.09	0.09	0.61
	(0.01)	(0.01)	(0.01)	(0.01)	
Monthly income	3,128	3,132	3,128	3,136	0.99
	(34.28)	(42.53)	(41.81)	(60.45)	
Panel B: monthly expenditures, pre-treatment					
Total	1,128.55	1,135.64	1,122.15	1,129.91	0.94
	(32.97)	(44.16)	(39.64)	(65.89)	
Durables	371.97	387.27	353.48	365.34	0.29
	(16.73)	(24.02)	(12.90)	(20.78)	
Tradable durables	274.10	286.23	259.47	268.88	0.37
	(15.32)	(22.30)	(10.26)	(16.59)	
Debt	1,909.97	1,883.86	1,934.88	1,907.70	0.67
	(47.53)	(57.22)	(61.10)	(87.98)	
Panel C: prior beliefs					
Prior exchange rate	-0.29	-0.37	-0.19	-0.27	0.16
	(0.08)	(0.10)	(0.10)	(0.14)	
Prior inflation	3.39	3.47	3.28	3.32	0.13
	(0.08)	(0.10)	(0.09)	(0.13)	
Observations	2,872	967	974	931	

Notes: The table reports pre-treatment characteristics and a test of randomization balance. Panel A reports demographic characteristics, based on the bank's administrative data. Panel B reports summary statistics on average monthly credit card spending in the 12 months prior to the intervention by category. The experiment was conducted over 3 months, therefore the expenditures in this panel are not perfectly aligned with Panel B of Table 2. Panel C reports data on prior beliefs elicited before respondents reached the information provision stage of the experiment. Column (1) reports pre-treatment characteristics for all survey respondents, columns (2) to (4) report the same characteristics for each of the three treatment conditions, that is, for respondents assigned to receive information about the exchange rate, the inflation rate, or both. Column (5) reports p-values of a test for the null hypothesis that the average pre-treatment characteristics are equal between the three treatment groups. Robust standard errors of the mean in parentheses.

Table 4: Effects of Information on Expectations and Behavior: Reduced Form Estimates

	Survey Data		Transaction Data			
	(1) Δ Inflation	(2) Δ Depreciation	(3) Durables	(4) Trad. Dur.	(5) Debt	(6) Total
$\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi}$	0.236***	0.032	1.646	1.497	10.036	-1.718
	(0.037)	(0.026)	(2.793)	(2.062)	(6.472)	(6.028)
$\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d}$	-0.030	0.064**	-3.402	-2.552	4.120	-4.195
	(0.023)	(0.031)	(2.595)	(1.916)	(6.930)	(5.944)
Observations	2,872	2,872	2,872	2,872	2,872	2,872
R-squared	0.393	0.236	0.249	0.199	0.052	0.371
Outcome mean	-0.369	-0.212	255.641	176.445	99.096	947.399
Outcome SD	2.695	2.837	339.340	250.156	758.368	902.024

Notes: Each column corresponds to a separate OLS regression with the same independent variables but different dependent variables. These regressions present the reduced-form effects of the information provision experiment. Column (1) corresponds to equation (4), column (2) to equation (5) and columns (3) through (6) correspond to equation (6). $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ is the gap between the feedback about inflation rate that could be shown to the individual and the individual's prior belief about the inflation rate. $T_{i,t}^{\pi}$ is an indicator variable that takes the value 1 if the feedback was shown to the subject and 0 otherwise. $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ and $T_{i,t}^{d}$ are the corresponding variables for the exchange rate instead of the inflation rate. All regressions control for $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ as well as the usual set of additional controls: number of dependents, week fixed effects, surveyors fixed effects, and 20 variables on the spending patterns during the four pre-treatment quarters. The dependent variables are listed as follows. Δ *Inflation* is the difference between the posterior and prior beliefs on the inflation rate (i.e., $\pi_{i,t}^{post} - \pi_{i,t}^{prior}$). Δ *Depreciation* is the difference between the posterior and prior beliefs on the exchange rate (i.e., $d_{i,t}^{post} - d_{i,t}^{prior}$). *Durables* is the monthly average expenditure across 3 months post-treatment in the durables category. *Trad. Dur.* is the monthly average expenditure across 3 months post-treatment in the tradable durables category. *Debt* is the monthly credit card debt accrued in the 3 months post-treatment. *Total* is the total average expenditure across 3 months post-treatment. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effects of Expectations on Behavior: Instrumental Variables Estimates

	Transaction Data			
	(1)	(2)	(3)	(4)
	Dur.	Trad. Dur.	Debt	Total
Δ Inflation	13.353	11.062	31.749	1.539
	(12.827)	(9.322)	(31.186)	(26.105)
	[-112.349, 139.055]	[-80.2917, 102.416]	[-273.87, 337.369]	[-254.286, 257.363]
Δ Exchange rate	-46.533	-34.420	78.673	-64.333
	(44.068)	(32.407)	(109.620)	(93.003)
	[-478.393, 385.327]	[-351.998, 283.159]	[-995.586, 1152.93]	[-975.749, 847.083]
Observations	2,872	2,872	2,872	2,872
Outcome mean	255.641	176.445	99.096	947.399
Outcome SD	339.340	250.156	758.368	902.024
Kleiberg-Paap F-statistics	2.394	2.394	2.394	2.394

Notes: Each column corresponds to a separate Instrumental Variables regression. The endogenous variables are: Δ *Inflation* is the difference between the posterior and prior beliefs on the inflation rate (i.e., $\pi_{i,t}^{post} - \pi_{i,t}^{prior}$); Δ *Exchange Rate* is the difference between the posterior and prior beliefs on the exchange rate (i.e., $d_{i,t}^{post} - d_{i,t}^{prior}$). The excluded instruments are $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi}$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d}$. All regressions control for $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ as well as the usual set of additional controls: number of dependents, week fixed effects, surveyors fixed effects, and 20 variables on spending patterns during the four pre-treatment quarters. The dependent variables are listed as follows. *Durables* is the monthly average expenditure across 3 months post-treatment in the durables category. *Trad. Dur.* is the monthly average expenditure across 3 months post-treatment in the tradable durables category. *Debt* is the monthly credit card debt accrued in the 3 months post-treatment. *Total* is the total average expenditure across 3 months post-treatment. Robust standard errors in parentheses. Weak instruments Anderson-Rubin confidence interval at 95% level in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Effects of Expectations on Behavior: OLS Estimates

	Transaction Data			
	(1) Durables	(2) Trad. Dur.	(3) Debt	(4) Total
Δ Inflation	-1.849	-0.358	-7.032	5.145
	(1.966)	(1.383)	(4.825)	(5.032)
Δ Exchange rate	-0.532	-0.662	-6.483	-3.519
	(2.000)	(1.523)	(4.798)	(4.798)
Observations	2,872	2,872	2,872	2,872
R-squared	0.249	0.198	0.052	0.371
Outcome mean	255.641	176.445	99.096	947.399
Outcome SD	339.340	250.156	758.368	902.024

Notes: Each column corresponds to a separate OLS regression. Δ *Inflation* is the difference between posterior and prior beliefs on inflation (i.e., $\pi_{i,t}^{post} - \pi_{i,t}^{prior}$). Δ *Exchange Rate* is the difference between the posterior and prior beliefs on the exchange rate (i.e., $d_{i,t}^{post} - d_{i,t}^{prior}$). All regressions include the usual set of additional controls: number of dependents, week fixed effects, surveyors fixed effects, and 20 variables on spending patterns during the four pre-treatment quarters. The dependent variables are listed as follows. *Durables* is the monthly average expenditure across 3 months post-treatment in the durables category. *Trad. Dur.* is the monthly average expenditure across 3 months post-treatment in the tradable durables category. *Debt* is the monthly credit card debt accrued in the 3 months post-treatment. *Total* is the total average expenditure across 3 months post-treatment. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Effects of Information on Expectations and Survey Outcomes: Reduced Form Estimates

	Survey Data					
	(1) Δ Inflation	(2) Δ Depreciation	(3) Dur.	(4) Trad. Dur.	(5) Debt	(6) Total
$\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi}$	0.236***	0.032	-0.001	-0.002	-0.003	-0.006
	(0.037)	(0.026)	(0.007)	(0.007)	(0.008)	(0.006)
$\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d}$	-0.030	0.064**	0.004	0.002	0.009	0.003
	(0.023)	(0.031)	(0.007)	(0.007)	(0.007)	(0.006)
Observations	2,872	2,872	2,872	2,872	2,872	2,872
R-squared	0.393	0.236	0.030	0.034	0.073	0.037
Outcome Mean	-0.369	-0.212	-0.055	0.005	-0.055	0.088
Outcome SD	2.695	2.837	0.857	0.775	0.857	0.665

Notes: The table reports reduced-form effects of the information provision experiment. Column (1) corresponds to equation (4), column (2) to equation (5) and columns (3) through (6) correspond to equation (6). $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ is the gap between the feedback about inflation rate that could be shown to the individual and the individual's prior belief about the inflation rate, while $T_{i,t}^{\pi}$ is an indicator variable that takes the value 1 if the feedback was shown to the subject and 0 otherwise. $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ and $T_{i,t}^{d}$ are the corresponding variables for the exchange rate instead of the inflation rate. All regressions control for $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ as well as the usual set of additional controls: number of dependents, week fixed effects, surveyors fixed effects, and 20 variables on spending patterns during the four pre-treatment quarters. The dependent variables are listed as follows. Δ *Inflation* is the difference between the posterior and prior beliefs on the inflation rate (i.e., $\pi_{i,t}^{post} - \pi_{i,t}^{prior}$). Δ *Depreciation* is the difference between the posterior and prior beliefs on the exchange rate (i.e., $d_{i,t}^{post} - d_{i,t}^{prior}$). The dependent variables in columns (3) through (6) correspond to the stated future consumption as measured in the survey, and they can take values +1 (if participants say they are going to spend more or think it is a good time to buy goods in the category), 0 (if they say that they are going to spend about the same or think it's neither good nor bad time to buy the goods) or -1 (if they are going to spend less or think it is a bad time to buy the goods). *Durables* corresponds to the future spending in durables, *Trad. Dur.* correspond to the future spending in electronics, *Debt* corresponds to future credit card borrowing, and *Total* corresponds to total future spending. Robust standard errors in parentheses. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Effects of Information on Expectations and Behavior by Size of Purchases: Reduced Form Estimates

	Durables			Tradable Durables			All		
	(1) p25	(2) p75	(3) Diff	(4) p25	(5) p75	(6) Diff	(7) p25	(8) p75	(9) Diff
$(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}) \cdot T_{i,t}^{\pi}$	-0.004	0.009	0.013	-0.007	0.008	0.015	-0.003	-0.003	0.000
	(0.007)	(0.009)	(0.011)	(0.007)	(0.009)	(0.011)	(0.005)	(0.007)	(0.009)
$(d_{i,t}^{signal} - d_{i,t}^{prior}) \cdot T_{i,t}^{d}$	-0.005	-0.011	-0.006	0.000	-0.010	-0.010	0.005	-0.006	-0.011
	(0.006)	(0.008)	(0.010)	(0.007)	(0.008)	(0.011)	(0.006)	(0.007)	(0.009)
Observations	2872	2872	2872	2872	2872	2872	2872	2872	2872
R-squared	0.406	0.240		0.389	0.196		0.599	0.379	
Outcome Mean	0.000	0.000		0.000	0.000		0.000	0.000	
Outcome SD	1.000	1.000		1.000	1.000		1.000	1.000	

Notes: Notes: Columns (1), (2), (4), (5), (7) and (9) correspond to a separate OLS regression with the same independent variables but different dependent variables. $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ is the gap between the feedback about inflation rate that could be shown to the individual and the individual's prior belief about the inflation rate. $T_{i,t}^{\pi}$ is an indicator variable that takes the value 1 if the feedback was shown to the subject and 0 otherwise. $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ and $T_{i,t}^{d}$ are the corresponding variables for the exchange rate instead of the inflation rate. All regressions control for $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ as well as the usual set of additional controls: number of dependents, week fixed effects, surveyors fixed effects, and 24 variables on the spending patterns during the four pre-treatment quarters. The dependent variables are listed as follows. *Durables* is the monthly average expenditure across 3 months post-treatment in the durables category. *Tradable Durables* is the monthly average expenditure across 3 months post-treatment in the tradable durables category. *All* is the monthly average expenditure across 3 months post-treatment in the tradable durables category in all categories. *p25* and *p75* are the monthly average expenditure across 3 months post-treatment in purchases whose price correspond to the lowest and top quartile in the distribution of the individual prices of purchases of their corresponding category, respectively. Columns (3), (6) and (9) correspond to the difference between the estimated coefficients by price of purchases in each category. Each dependent variable is standardized for comparability. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Effects of Hypothetical Shocks on Planned Expenditures

Scenario:	Inflation				Depreciation			
	(1) Dur.	(2) Trad. Dur.	(3) Debt	(4) Total	(5) Dur.	(6) Trad. Dur.	(7) Debt	(8) Total
Panel A: Baseline								
Δ Belief	-0.019***	-0.021***	0.001	0.003	-0.025***	-0.027***	0.000	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	2302	2302	2302	2302	2302	2302	2302	2302
R-squared	0.187	0.202	0.150	0.202	0.230	0.202	0.139	0.172
Outcome mean	0.033	0.038	-0.126	-0.225	-0.096	-0.180	0.160	0.177
Outcome SD	0.743	0.775	0.745	0.742	0.757	0.752	0.748	0.784
Panel B: By financial literacy								
Δ Belief	-0.008**	-0.010***	0.007*	0.003	-0.012***	-0.013***	-0.001	0.001
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
Δ Belief $\cdot L_i$	-0.017***	-0.017***	-0.007	-0.001	-0.020***	-0.023***	-0.002	0.004
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	1910	1910	1910	1910	1910	1910	1910	1910
R-squared	0.219	0.226	0.158	0.224	0.237	0.205	0.144	0.176
Outcome mean	0.033	0.038	-0.126	-0.225	-0.096	-0.180	0.160	0.177
Outcome SD	0.743	0.775	0.745	0.742	0.757	0.752	0.748	0.784

Notes: Each column corresponds to a separate OLS regression, reporting the reduced-form effects of the subjective model experiment. Panel A shows the effect of increase in expected inflation and depreciation rates in a hypothetical scenarios relative to the respondents prior beliefs. Panel B shows the effect for high and low financial literacy groups. Columns (1) through (4) correspond to the estimates for the inflation scenario and columns (5) through (8) correspond to the depreciation scenario. For the inflation scenario, $\Delta \text{ Belief}_i = \left(\pi_i^{scenario} - \pi_i^{prior}\right)$, which denotes the gap between the hypothetical inflation rate shown to the individual and the individual's prior belief. For the depreciation scenario, $\Delta \text{ Belief}_i = \left(d_i^{scenario} - d_i^{prior}\right)$, which is the analogous gap for the depreciation rate. L_i is an indicator variable that takes the value 1 if the respondent has the big-3 financial literacy score higher or equal to the median across waves and 0 otherwise. Each regression controls for the corresponding "status-quo" hypothetical outcome. Panel B regressions also control for the literacy group indicator L_i and the interaction L_i with the "status quo" hypothetical outcome. *Durables* corresponds to the future spending in durables, *Trad. Dur.* correspond to the future spending in electronics, *Debt* corresponds to future credit card borrowing, and *Total* corresponds to total future spending. The dependent variables in columns (3) through (6) correspond to the stated future consumption as measured in the survey, and they can take values +1 (if participants say they are going to spend more or think it is a good time to buy goods in the category), 0 (if they say that they are going to spend about the same or think it's neither good nor bad time to buy the goods) or -1 (if they are going to spend less or think it is a bad time to buy the goods). Robust standard errors in parentheses. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Effects of Hypothetical Shocks on Demand for Inflation Indexed Security

Dep. var.:	Demand for inflation indexed asset			
Scenario:	Inflation		Depreciation	
	(1)	(2)	(3)	(4)
Δ Belief	0.015***	-0.010	0.020***	0.000
	(0.004)	(0.009)	(0.004)	(0.009)
Δ Belief $\cdot L_i$		0.048***		0.028**
		(0.012)		(0.012)
Observations	789	397	789	397
R-squared	0.047	0.079	0.107	0.112
Outcome mean	-0.185	-0.109	-0.165	-0.132
Outcome SD	0.914	0.927	0.908	0.912

Notes: Each column corresponds to a separate OLS regression. These regressions present the reduced-form effects of the subjective model experiment. Panel A shows the effect of increase in expected inflation and depreciation rates in a given hypothetical scenario relative to the respondents prior beliefs. Panel B shows the effect for high and low financial literacy groups. Columns (1) through (3) correspond to the estimates for the inflation scenario and columns (4) through (6) correspond to the depreciation scenario. For the inflation scenario, Δ Belief$_i = \left(\pi_i^{scenario} - \pi_i^{prior}\right)$, which denotes the gap between the hypothetical inflation rate shown to the individual and the individual's prior belief. For the depreciation scenario, Δ Belief$_i = \left(d_i^{scenario} - d_i^{prior}\right)$, which is the analogous gap for the depreciation rate. L_i is an indicator variable that takes the value 1 if the respondent has the big-3 financial literacy score higher or equal to the median across waves and 0 otherwise. Each regression controls for the corresponding "status-quo" hypothetical outcome. Panel B regressions also control for the literacy group indicator L_i and the interaction L_i with the "status quo" hypothetical outcome. *Durables* corresponds to the future spending in durables, *Trad. Dur.* correspond to future spending on electronics, *Debt* corresponds to future credit card borrowing, and *Total* corresponds to total future spending. The dependent variables in columns (3) through (6) correspond to self-reported consumption plans as measured in the survey, and can take values +1 (if participants say they are going to spend more or think it is a good time to buy goods in the category), 0 (if they say that they are going to spend about the same or think it's neither good nor bad time to buy goods) or -1 (if they are going to spend less or think it is a bad time to buy goods). Robust standard errors in parentheses. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Supplementary Appendix (for Online Publication)

A Proof of Propositions

A.1 Lemma 1

The three statements are true:
(1) C_t^N and C_t^T are non-decreasing in π_{t+1}^N and π_{t+1}^T.
(2) X_t^N is increasing in π_{t+1}^N. X_t^T is increasing in π_{t+1}^T.
(3) X_t^N is non-decreasing in π_{t+1}^T. X_t^T is non-decreasing in π_{t+1}^N.

Proof:

Observe that Cobb-Douglas structure of preferences allows us to write a closed form solution for C_t^N:

$$C_t^N = \frac{\alpha\theta}{\sum_{k=0}^{\infty}\beta^k}\frac{\sum_{k=0}^{\infty}P_{t+k}^N Y_{t+k}/\prod_{i=1}^{k}R_{t+i}}{P_t^N} =$$

$$\frac{\alpha\theta}{\sum_{k=0}^{\infty}\beta^k}\sum_{k=0}^{\infty}\frac{\prod_{i=1}^{k}\pi_{t+i}^N Y_{t+k}}{\prod_{i=1}^{k}R_{t+i}}$$

Hence:

$$\frac{dC_t^N}{d\pi_{t+1}^N} = \frac{\alpha\theta}{\sum_{k=0}^{\infty}\beta^k}\sum_{k=0}^{\infty}\frac{\prod_{i=2}^{k}\pi_{t+i}^N Y_{t+k}}{\prod_{i=1}^{k}R_{t+i}} > 0$$

$$\frac{dC_t^N}{d\pi_{t+1}^T} = 0$$

From the first order conditions, one can obtain:

$$\frac{\theta}{1-\theta}\frac{C_t^T}{C_t^N} = \frac{P_t^N}{P_t^T}$$

This implies similar conditions for C_t^T:

$$\frac{dC_t^T}{d\pi_{t+1}^N} > 0 \quad \text{and} \quad \frac{dC_t^T}{d\pi_{t+1}^T} = 0$$

, which concludes the proof of statement (1).

From the first order conditions one gets:

$$\frac{(1-\alpha)C_t^N}{\alpha X_t^N} = \left(1-(1-\delta)\frac{\pi_{t+1}^N}{R_{t+1}}\right)$$

$$\frac{(1-\alpha)C_t^T}{\alpha X_t^T} = \left(1-(1-\delta)\frac{\pi_{t+1}^T}{R_{t+1}}\right)$$

This implies that for $I \in \{N, T\}$, $\frac{X_t^I}{C_t^I}$ increases in π_{t+1}^I. Since by statement (1), C_t^I does not decrease in π_{t+1}^I, X_t^I has to increase. This proves statement (2).
Finally, since i) the conditions pin down the $\frac{X_t^I}{C_t^I}$ for fixed π_{t+1}^I, and ii) C_t^I is non-decreasing in π_{t+1}^{-I}, X_t^I does not decrease in π_{t+1}^{-I} ($-I$ denotes $\{N, T\} \setminus I$), which proves statement (3).

A.2 Proof of Proposition 1

By Assumption 1, an increase in π_{t+1} does not decrease π_{t+1}^I, $I \in \{N, T\}$ and has to strictly increase at least one of them. By Lemma 1, this implies that X_t^I do not decrease and at least one of them increases. Since X_{t-1}^I and P_t^I are fixed, the same is true for $P_t^I \Delta X_t^I$. Hence, $P_t^N \Delta X_t^N + P_t^T \Delta X_t^T$ increases in π_{t+1}.

A.3 Proof of Proposition 2

By Assumption 2, π_{t+1}^T increases in E_{t+1}. By Lemma 1, this implies that X_t^T increases in E_{t+1}. Hence $P_t^T \Delta X_t^T$ increases in E_{t+1}.

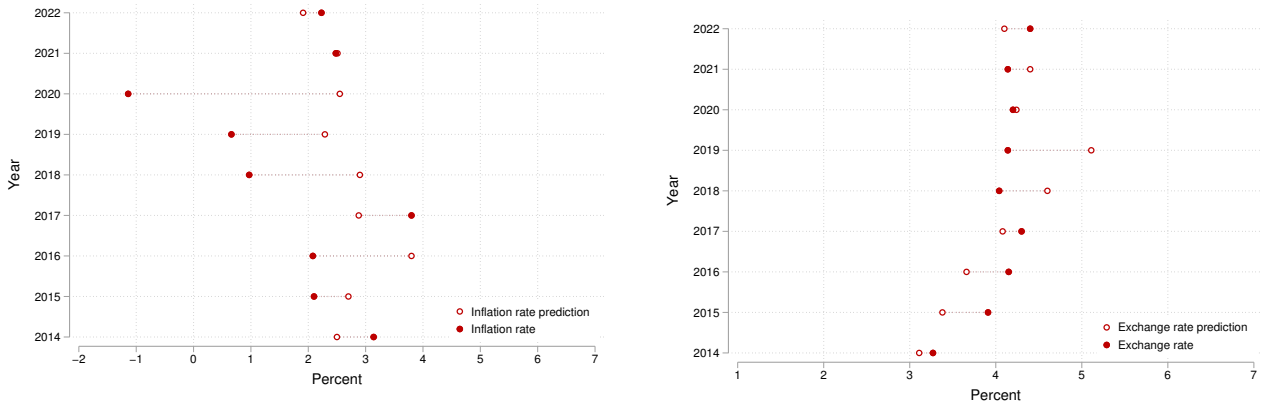
A.4 Proof of Proposition 3

$$A_{t+1} = P_t Y_t + R_t A_t - P_t^N (C_t^N + X_t^N - X_{t-1}^N + \delta X_t^N) -$$
$$- P_t^T (C_t^T + X_t^T - X_{t-1}^T + \delta X_t^T)$$

By Assumption 1, neither π_{t+1}^T nor π_{t+1}^T decrease, and at least one of them increases with π_{t+1}. This and Lemma 1 imply that neither of C_t^I and X_t^I, $I \in \{N, T\}$ decreases, and at least one of X_t^I increases. Hence, A_{t+1} decreases and $A_t - A_{t+1}$ increases.

B Appendix Figures

Figure B.1: Accuracy of Expert Forecasts



(a) Inflation Expectations

(b) Exchange Rate Expectations

Notes: The figure shows the difference between predicted and realized inflation and exchange rates in historical data, taken from the same sources used to provide information in the experiment. Forecasts are recovered for the same time horizon (12 months) at which we provide information in the experiment. Inflation forecasts are taken from Statista (www.statista.com), exchange rate forecasts are taken from Trading Economics (www.tradingeconomics.com).

C Additional Analysis and Robustness Checks

C.1 Event-Study Falsification Tests

we leverage data on pre-treatment spending, which allows us to conduct a falsification test in the spirit of an event-study analysis. We estimate a similar regression as in equation (6) but using pre-treatment instead of post-treatment spending as the dependent variables:

$$\begin{aligned} Y_{i,t-1} = {} & \alpha_Y^{\pi} \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi} + \alpha_Y^{d} \cdot \left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d} + \\ & \beta_Y^{\pi} \cdot \left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) + \beta_Y^{d} \cdot \left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) + X_{i,t}\gamma_Y + \epsilon_i \end{aligned} \tag{C.1}$$

The dependent variable $Y_{i,t+1}$ refers to the average monthly spending in the 3 months pre-treatment, and the set of control variables ($X_{i,t}$) include just the number of dependents, week fixed effects, surveyors fixed effects.

The results are presented in Table C.1. Since the outcomes are measured at a point in time when participants had not yet been provided with information, there should be no effects of the information on pre-treatment spending. As expected, we find no "effects" of the information shocks on the pre-treatment spending outcomes. For example, the first coefficient from column (1) indicates that a 1 pp increase in the inflation shock had an "effect" on pre-treatment spending on durables that is close to zero ($0.185, or <0.001 standard deviations) and statistically insignificant. Likewise, the rest of the coefficients from Table C.1 are close to zero and statistically insignificant.

Table C.1: Effects of Information on Behavior: Event-Study Falsification Tests

	Transaction Data			
	(1) Durables	(2) Trad. Dur.	(3) Debt	(4) Total
$\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi}$	-0.154	-1.826	3.161	0.356
	(2.708)	(1.963)	(6.608)	(5.779)
$\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d}$	0.209	-2.506	-10.146	4.119
	(2.706)	(2.080)	(6.841)	(5.912)
Observations	2,872	2,872	2,872	2,872
R-squared	0.221	0.165	0.025	0.346
Outcome Mean	284.843	196.553	157.014	958.194
Outcome SD	352.911	260.234	794.367	887.150

Notes: Each column corresponds to a separate OLS regression with the same independent variables but different dependent variables. All regression corresponds to equation (C.1). $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ is the gap between the feedback about inflation rate that could be shown to the individual and the individual's prior belief about the inflation rate. $T_{i,t}^{\pi}$ is an indicator variable that takes the value 1 if the feedback was shown to the subject and 0 otherwise. $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ and $T_{i,t}^{d}$ are the corresponding variables for the exchange rate instead of the inflation rate. All regressions control for $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ as well as the following set of additional controls: number of dependents, week fixed effects, and surveyors fixed effects. The dependent variables are listed as follows. *Dur.* is the monthly average expenditure across 3 months pre-treatment in the durables category. *Trad. Dur.* is the monthly average expenditure across 3 months pre-treatment in the tradable durables category. *Debt* is the monthly credit card debt accrued in the 3 months pre-treatment. *Total* is the total average expenditure across 3 months pre-treatment. Robust standard errors in parentheses. $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C.2: Effects of Information on Expectations and Behavior by Size of Purchases of Categories: Reduced Form Estimates

	Durables			Tradable Durables			All		
	(1) Bottom 3 Cat.	(2) Top 3 Cat.	(3) Diff	(4) Bottom 3 Cat.	(5) Top 3 Cat.	(6) Diff	(7) Bottom 3 Cat.	(8) Top 3 Cat.	(9) Diff
$(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}) \cdot T_{i,t}^{\pi}$	-0.006	0.000	0.006	-0.006	0.003	0.009	0.004	0.000	-0.005
	(0.008)	(0.009)	(0.012)	(0.008)	(0.009)	(0.012)	(0.007)	(0.009)	(0.012)
$(d_{i,t}^{signal} - d_{i,t}^{prior}) \cdot T_{i,t}^{d}$	0.005	0.004	-0.001	0.005	0.004	-0.001	-0.004	0.004	0.008
	(0.008)	(0.008)	(0.011)	(0.008)	(0.008)	(0.012)	(0.008)	(0.008)	(0.011)
Observations	2872	2872	2872	2872	2872	2872	2872	2872	2872
R-squared	0.089	0.155		0.089	0.104		0.176	0.155	
Outcome Mean	0.000	0.000		0.000	0.000		0.000	0.000	
Outcome SD	1.000	1.000		1.000	1.000		1.000	1.000	

Notes: Notes: Columns (1), (2), (4), (5), (7) and (9) report separate OLS regressions with the same independent variables but different dependent variables. $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ is the gap between the feedback about inflation that could be shown to the individual and their prior belief about the inflation rate. $T_{i,t}^{\pi}$ is an indicator variable that takes the value 1 if the feedback was shown to the subject and 0 otherwise. $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ and $T_{i,t}^{d}$ are the corresponding variables for the exchange rate instead of the inflation rate. All regressions control for $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ as well as the usual set of additional controls: number of dependents, week fixed effects, surveyors fixed effects, and 24 variables on the spending patterns during the four pre-treatment quarters. The dependent variables are listed as follows. *Durables* is the monthly average expenditure across 3 months post-treatment in the durables category. *Tradable Durables* is the monthly average expenditure across 3 months post-treatment in the tradable durables category. *All* is the monthly average expenditure across 3 months post-treatment in the tradable durables category in all categories. *Bottom 3 Cat.* and *Top 3 Cat.* are the monthly average expenditure across 3 months post-treatment in the categories with the lowest and highest median prince of individual purchases, respectively. The categories with the lowest median price are *Direct Marketing*, *Groceries and Books* and *Stationery*. The categories with the highest median price are *Automotive*, *Jewellery and Watches* and *Insurance* Columns (3), (6) and (9) correspond to the difference between the estimated coefficients by price of purchases in each category. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

D Survey Instrument

Hello! My name is [surveyor name]. I am working for researchers at the University of California, Los Angeles, currently working in Malaysia. We are conducting a short survey to know Malaysians overall economical situation. Do you have five minutes to respond to the survey?

- Yes
- No

[If the answer to the previous question was "yes":] Great, thank you so much. By the way, if you'd prefer to do the survey in Alternative Language, let me know. I will start asking a few questions about your background.

What is your current employment situation?

- Full-time employee
- Part-time employee
- Self-employed
- Not working

What is your highest education level?

- No school
- High school
- College or some college
- After bachelor degree

Are you married or single?

- Married
- Single
- Divorced

Do you have any children or other dependents that you look after?

- Yes
- No

[If the answer to the previous question was "yes":] How many?

- 1
- 2
- 3
- 4
- 5 or more

Regarding business conditions in the country as a whole, do you think that during the next 12 months the Malaysian economy will be better off, about the same, or worse off?

- Better off
- About the same
- Worse off

Now we want to ask you about the annual inflation rate, which is a measure of how prices in Malaysia change in general. In your opinion, what will be the inflation rate over the next 12 months?

- [ ] %

Now we want to ask you about the exchange rate. As of April 2019, 1 U.S. Dollar is worth around 4.05 Ringgit Malaysia. In your opinion, what will the exchange rate be 12 months from now, in April 2020?

- [ ] Ringgit Malaysia

In this stage, we randomly select respondents to receive some feedback about the previous questions. [Subjects are randomly assigned to one of the following three treatments.]

Treatment Exchange Rate: The consensus among economic experts both from the government and the private sectors is that 1 U.S. Dollar will be worth 4.10 Ringgit Malaysia one year from now.

Treatment Inflation: The consensus among economic experts both from the government and the private sectors is that the inflation in Malaysia will be 2.3% over the next 12 months.

Treatment Both: The consensus among economic experts both from the government and the private sectors is that the inflation in Malaysia will be 2.3% over the next 12 months and 1 U.S. Dollar will be worth 4.10 Ringgit Malaysia one year from now.

What will the inflation rate be over the next 12 months?

- [ ] %

What will be the exchange rate from U.S. Dollar to Ringgit 12 months from now, in April 2020?

- [ ] Ringgit Malaysia

Regarding business conditions in the country as a whole, do you think that during the next 12 months the Malaysian economy will be better off, about the same, or worse off?

- Better off
- The same
- Worse off

Looking forward, would you say that you and your family living with you will be better off or worse off financially than you are now?

- Better off
- About the same
- Worse off

Do you expect your credit card spending to go up, stay the same, or go down during the next 3 months?

- Go up
- Stay the same
- Go down

Do you expect that your spending on groceries to go up, stay the same, or go down during the next 3 months?

- Go up
- Stay the same
- Go down

Do you expect your total spending to go up, stay the same, or go down during the next 3 months?

- Go up
- Stay the same
- Go down

Do you think now is a good time, a bad time, or neither a good nor a bad time to buy household items, such as furniture or a refrigerator? More examples: television, stove or others

- Yes, it's a good time
- It's neither a good nor a bad time
- No, it's a bad time

Do you think now is a good time, a bad time, or neither a good nor a bad time to buy electronic items, such as a computer, TV, phone, washing machine and so on?

- Yes, it's a good time
- It's neither a good nor a bad time
- No, it's a bad time

Do you think now is a good time, a bad time, or neither good nor a bad time to buy a vehicle, car or motorbike?

- Yes, it's a good time
- It's neither a good nor a bad time
- No, it's a bad time

Do you think now is a good time, a bad time, or neither good or bad time to buy big items on an installment basis? [If asked, provide the following examples: installments such as AEON Credit, Courts Mammoth; items such as a car, motorbike, television set, washing machine and so on.]

- Yes, it's a good time
- It's neither a good nor a bad time
- No, it's a bad time

E Complementary Survey Experiment, Questionnaire

Hello. We are conducting a survey about the economic outlook for Malaysia. This survey consists of 42 questions and takes approximately 10 minutes. The questions in this survey have no right or wrong answers — we are interested in your views and opinions. Your responses are 100% confidential.At the end of the survey you will have a box where you can let us know if there are any problems with the survey.

- YES, I would like to participate in this survey

- NO, I don't want to participate in this survey

Which of these words is the most associated with the word "paint"?

- draw
- run
- sports
- loud

Which of these words is the most associated with the word "cucumber"?

- video
- trigger
- vegetable
- heel

Recent research on decision making shows that choices are affected by the context in which they are made. Differences in how people feel, in their previous knowledge and experience, and in their environment can influence the choices they make. To help us understand how people make decisions, we are interested in information about you, specifically whether you actually take the time to read the instructions; if you don't, some results may fail to tell us very much about decision making in the real world. To help us confirm that you have read these instructions, please select the "none of the above" option below. Thank you very much.

- Interested
- ...
- None of the above

To get a general picture of the people answering this survey, we would like to know a few things about your background. What is your current employment situation?

- Working full time for someone
- Working part time for someone
- Self-employed
- Not working

Do you have any of the following types of financial products or accounts?

- Bank account — Yes/No
- Debit card — Yes/No
- Charge (prepaid) card — Yes/No
- Credit card — Yes/No

What is your approximate monthly income?

- Less than MYR 1000
- Between MYR 1000 and 2000
- Between MYR 2000 and 3000
- Between MYR 3000 and 5000
- More than MYR 5000

What is your highest education level?

- No school
- High school
- College or some college
- After bachelor degree

Are you married or single?

- Married
- Single
- Divorced

Do you have any children or other dependents that you look after?

- Yes
- No
- Display This Question:
- If Do you have any children or other dependents that you look after? = Yes

[If answered 'Yes' to previous question]

How many?

- 1
- 2
- 3
- 4
- 5 or more

Please confirm that that you are not a robot.

[Captcha box]

Now we want to ask you about the exchange rate. As of [Current month, year], 1 U.S. Dollar is worth around [Current exchange rate] Ringgit Malaysia. In your opinion, what will the exchange rate be 12 months from now, in [Current month, next year]?

- 3.70 RM
- ...
- 4.70 RM

Now, we will give you a couple of hypothetical scenarios, and we want to ask about your expectations and spending plans in each scenario.

In this section we sequentially ask about three scenarios

Here is the first scenario we want you to consider:/ Now, we give you a second, different scenario: / Now, we give you a third, different scenario:

Prior: suppose the inflation rate will be [Prior inflation] and the exchange rate will go from [Current forex] RM to [Prior forex] RM per 1 U.S. Dollar (a X% depreciation) over the next 12 months.
Inflation: Suppose the inflation rate will be [Prior inflation + random inflation change] over the next 12 months.
Forex: Suppose the exchange rate will go from [Current forex] RM to [Prior forex · (1 + random forex change)] RM per 1 U.S. Dollar (a X% depreciation) over the next 12 months.
Each random change is sampled from $\{-10, -3, 3, 10\}$ *percentage points.*

The fixed income treatment add "Assume that, other than this, business conditions, interest rates, and your personal financial situation remain the same." to each scenario.

Here is the first scenario we want you to consider: **[Present scenario]**

[Present scenario]

Imagine that you are offered to choose between two savings accounts. The first pays an interest rate of 5% per year. The second pays 1% per year after correcting for the inflation rate. Which account would you choose?

- First account: 5% per year
- Second account: 1% per year + inflation
- Don't know

[Present scenario]
In this scenario, do you expect your credit card spending to go up, stay the same, or go down during the next 3 months?

- Go up
- Stay the same
- Go down

[Present scenario]
In this scenario, do you expect your spending on groceries to go up, stay the same, or go down during the next 3 months?

- Go up
- Stay the same
- Go down

[Present scenario] In this scenario, do you expect your total spending to go up, stay the same, or go down during the next 3 months?

- Go up
- Stay the same
- Go down

[Present scenario] In this scenario, do you think it would be a good time, a bad time, or neither a good nor a bad time to buy household items, such as furniture, television, stove, or a refrigerator?

- Yes, it would be a good time
- It'd be neither a good nor a bad time
- No, it would be a bad time

[Present scenario] In this scenario, do you think it would be a good time, a bad time, or neither a good nor a bad time to buy electronic items, such as a computer, handphone, and so on?

- Yes, it would be a good time

- It'd be neither a good nor a bad time
- No, it would be a bad time

[Present scenario]

In this scenario, do you think it would be a good time, a bad time, or neither good nor a bad time to buy a vehicle, car, or motorbike?

- Yes, it would be a good time
- It'd be neither a good nor a bad time
- No, it would be a bad time

[Present scenario]

In this scenario, do you think it would be a good time, a bad time, or neither good or bad time to buy big items on an installment basis?

- Yes, it would be a good time
- It'd be neither a good nor a bad time
- No, it would be a bad time

[Present scenario]

In this scenario, would you say that you and your family living with you will be better off or worse off financially than you are now?

- Better off
- About the same
- Worse off

Imagine that you are offered to choose between two savings accounts. The first pays an interest rate of 5% per year. The second pays 1% per year after correcting for the inflation rate. You expect that the inflation rate is going to be 7%.Which account would you choose?

- First account: 5% per year
- Second account: 1% per year + inflation
- Don't know

Suppose that the inflation rate increases from [Prior inflation belief] to [Prior inflation belief + 10 pp.]. Assume that, other than this, business conditions, interest rates, and your personal financial situation remain the same. Which of the following is the best thing to do in this situation?

- It is best to spend more with a credit card
- It is best to spend less with a credit card
- I don't know if it is better to spend more or less with a credit card

Suppose that you expect the value of the Ringgit to decrease from [Prior forex belief] US dollars per 1 RM to [Prior forex belief · 1.1] US dollars per 1 RM one year from now and you are planning to buy some electronics. Assume that, other than this, business conditions, interest rates, and your personal financial situation remain the same. Which of the following is the best thing to do in this situation?

- It is best to buy electronics now
- It is best to buy electronics later
- I don't know if it's better to buy electronics now or later in this scenario.

Suppose that you expect the value of the Ringgit to decrease from [Prior forex belief] US dollars per 1 RM to [Prior forex belief · 1.1] US dollars per 1 RM and you are planning to buy a car or a motorbike. Assume that, other than this, business conditions, interest rates, and your personal financial situation remain the same. Which of the following is the best thing to do in this situation?

- It is best to buy a car or a motorbike now
- It is best to buy a car or a motorbike later
- I don't know if it's better to buy a car or a motorbike now or later in this scenario

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

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

Please tell me whether this statement is true or false. "Buying a single company's stock usually provides a safer return than a mutual fund that invests in the stocks of multiple companies."

- True
- False
- Do not know

How would you rate your understanding of the questions included in this survey?

- I understood all the questions
- There were a few questions I did not understand
- There were several questions I did not understand
- There were many questions I did not understand

Thank you for your participation in this survey!