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MACROECONOMIC EXPECTATIONS AND CREDIT CARD SPENDING

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ABSTRACT

We examine how macroeconomic expectations affect consumer decisions, using an experiment with 2,872 credit card customers at a large commercial bank. In the experiment, participants are randomized into receiving expert forecasts of inflation and the nominal exchange rate. We find that forecasts significantly affect inflation and exchange rate expectations, but do not change spending or self-reported consumption plans as predicted by standard models of intertemporal choice. Results from a supplementary survey experiment suggest that consumers are sophisticated enough to anticipate nominal rigidities and reduce spending on durables for precautionary reasons, counteracting the effects predicted by standard models of intertemporal optimization.

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Models of macroeconomics and household finance 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, there is surprisingly little causal evidence on the effect of macroeconomic expectations on consumer behavior.

There are several reasons why the link between macroeconomic expectations and household behavior may be more tenuous than is generally assumed. For example, the average household might lack the sophistication to optimally adjust consumption plans in response to changes in macroeconomic expectations, make inference errors that hinder 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 to affect everyday spending decisions, and there may be significant heterogeneity in how consumers assess the expected effect of macroeconomic events. The resulting failure of consumers to factor macroeconomic expectations into their decisions could have far-reaching consequences for the effectiveness 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.[1]

In this paper, we provide new evidence on the causal effect of macroeconomic expectations on consumption decisions. We conducted an information provision experiment with credit card customers of a large commercial bank in an emerging market and focus on two macroeconomic variables that have received significant 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 influences their macroeconomic expectations, spending plans, and actual consumption decisions, as observed in detailed transaction-level data on credit card spending.

We partnered with a large Malaysian bank to integrate a randomized experiment into the bank's standard customer communications. The experiment was conducted as part of a telephone survey with the bank's credit card customers and was carried out in four steps. First, the survey elicited respondents' inflation and exchange rate expectations. Second, subjects were randomly assigned to receive expert forecasts on inflation, the exchange rate, or both. Third, we elicited posterior beliefs and self-reported spending plans for all participants. Finally, we merged survey responses with comprehensive transaction-level credit card spending data provided by the bank, which allows us to examine the effect of macroeconomic expectations on actual consumption behavior.

The setting and population of customers used in our experiment offer several advantages that help us explore the link between macroeconomic expectations and economic decisions. Macroeconomic trends in Malaysia are representative of many small open economies and provide an interesting contrast between the evolution of inflation and exchange rates. Inflation has remained stable at low levels for decades, hovering between 1% and 3% annually since 2005. In contrast, the nominal exchange rate has been highly volatile over the same period, with fluctuations between 3.08 and 4.45

[1] See Bernanke (2007) and Coibion, Georgarakos, Gorodnichenko, and Weber (2023). 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." (Source: `www.federalreserve.gov/faqs`).

Malaysian ringgit (MYR) per U.S. dollar (US$). This volatility, coupled with a high share of imported goods in the average household's consumption basket, suggests that —in line with models of rational inattention—it may be more important for consumers to stay up-to-date on exchange rate movements and factor these expectations into their spending decisions. This feature of the study setting allows us to benchmark the effects of macroeconomic information with different levels of salience. This helps us shed light on the effect 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 credit card holders for whom we can obtain detailed transaction-level data that can be classified by type of expenditure. The requirements for obtaining a credit card in Malaysia are such that individuals in our sample are among the bank's most educated and financially experienced customers and therefore should be one of the populations that is most likely to revise consumption decisions in line with macroeconomic expectations. Moreover, as consumers in our study are relatively affluent, their consumption bundle includes significant shares of durable and tradable goods, the two spending categories that one would expect to be most affected by changes in exchange rate and inflation expectations.

We present three main findings. First, the information provided in the experiment significantly influences the formation of consumer expectations. The vast majority of individuals whose inflation and exchange rate expectations initially differ from expert forecasts update their expectations in response to our information treatments. Specifically, a 1 percentage point (pp) increase in the information shock about future inflation raises inflation expectations by 0.235 pp (p-value < 0.001). Similarly, a 1 pp information shock about the exchange rate raises exchange rate expectations by 0.066 pp (p-value = 0.035). The finding that expectations are more responsive to information about inflation than to information about the nominal exchange rate aligns with the idea that consumers in our setting have greater incentives to stay informed about the exchange rate, leading to stronger prior beliefs.

The second result is that changes in macroeconomic expectations induced by our experiment do not translate into changes in consumption in the direction predicted by a standard model of intertemporal choice. We examine the mechanism behind this result and present evidence suggesting that consumers' spending response is dampened by nominal rigidities. We test three basic predictions of a standard model of optimal intertemporal consumption: (i) higher inflation expectations should increase spending on durable goods; (ii) higher expected exchange rate depreciation should increase spending on tradable durables; and (iii) conditional on the nominal interest rate, higher inflation expectations should increase credit card borrowing. We do not find empirical support for these predictions. Instead, the effects of information shocks induced by the experiment on spending are close to zero and statistically insignificant. Although we cannot rule out small effects on any specific outcome, we have sufficient statistical power to rule out moderate or large effects. For some outcomes, such as total spending, the point estimates suggest that, if anything, there is a reduction in spending in response to an anticipated increase in inflation and exchange rate devaluations, which is the opposite of the substitution pattern predicted by a standard Euler equation model. Moreover, shocks to expectations do not affect self-reported spending plans or beliefs about the state of the economy as a whole, which we elicit immediately after the information-provision stage of the experiment.

To explore causal mechanisms and understand why changes in macroeconomic expectations do not affect spending decisions, we combine findings from the main study with a complementary "mental model" survey experiment. In this supplementary experiment, participants were assigned to randomized inflation and exchange rate scenarios and asked about their spending plans in each scenario. We also elicited demand for inflation-indexed securities and a standard measure of financial literacy. The results show that consumers exhibit demand for inflation-protected assets in response to heightened inflation expectations, and that deviations from the predictions of a standard intertemporal consumption model are most pronounced among more financially literate respondents. This suggests that consumers in our study population are sophisticated enough to understand the effect of inflation and exchange rate depreciation on real income. We additionally show that deviations from standard Euler equation optimization are larger for individuals who face greater nominal wage rigidity or have a higher share of foreign currency spending at baseline. Our preferred interpretation of these results is that consumers reduce spending in anticipation of nominal rigidities. That is, consumers understand that wage indexation is imperfect and reduce spending because they expect the purchasing power of their income to decline as inflation rises or the local currency depreciates. This counteracts the substitution effects predicted by a standard Euler equation model of intertemporal choice and dampens the spending response to macroeconomic information.

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 intend to change their spending, but are unable to follow through on their plans because of time-inconsistency and commitment problems. We show that our results are not consistent with this hypothesis: The respondents change neither their actual consumption nor their self-reported consumption plans, elicited immediately after the information provision stage of the experiment, in response to macroeconomic information. Second, it could be that macroeconomic information is not sufficiently salient or memorable to affect spending, especially when transaction amounts are small. We compare treatment effects by transaction size and by time since treatment and find no support for this hypothesis. Third, it is possible that consumers are not sophisticated enough to understand how to optimize their spending in response to new information. This channel is also unlikely to explain our results. We first note that our sample consists of credit customers who have significantly more financial experience than the average consumer and we additionally show that deviations from the model of intertemporal substitution are the largest among participants who are most financially literate. Finally, we can also rule out the possibility that consumers reduce spending because they associate higher inflation or anticipated exchange rate depreciation with worsening overall economic conditions. The results of the main experiment show that our information treatments have no meaningful effect on participants' expectations about their personal financial situation or the overall state of the economy.

Our study of macroeconomic expectations and consumer behavior relates to several strands of the literature. First, and most directly, our paper is related to research on the role of subjective expectations in macroeconomics and household finance (Roth and Wohlfart 2020; Beshears et al. 2018). In this literature, macroeconomic expectations play a central role in models that rely on the consumption Euler equation to microfound individual saving and consumption behavior. Although 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, Reis, and Wolfers 2003; Armantier et al. 2016; Cavallo, Cruces, and Perez-Truglia 2016, 2017; Andre et al. 2022; Giglio et al. 2021; Roth and Wohlfart 2020). Growing evidence shows how macroeconomic expectations are formed. For example, 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 macroeconomic 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. However, less is known about how people 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 effect 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. Although inflation has been low and stable in recent decades and is therefore arguably less relevant for most households, large fluctuations in the nominal exchange rate continue to be commonplace around the world and are therefore more consequential for 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, in conjunction with contemporaneous work by Coibion, Gorodnichenko, and Weber (2022), our paper is the first to measure the effect of macroeconomic expectations on actual spending, observed without survey 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.[2] This overcomes several limitations of existing studies that rely on survey data to measure effects 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.

Finally, our study also speaks to the effect 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 retail investor decisions. They show that beliefs are reflected in asset allocation and change in response to discrete macroeconomic events, such as a stock market crash. Aaronson, Agarwal, and French (2012), Agarwal, Liu, and Souleles (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

[2] 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.

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 lie at the heart of household finance.

1 Theoretical Framework and Hypotheses

We use a standard model of intertemporal 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 $\frac{d\pi_{t+1}^N}{d\pi_{t+1}} \geq 0, \quad \frac{d\pi_{t+1}^T}{d\pi_{t+1}} \geq 0.$

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 U.S. 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 nondurables and nontradables, 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 nontradable) $P^N_t \Delta X^N_t + P^T_t \Delta X^T_t$ increases with expected inflation π_{t+1}.*

The intuition for this standard result (see, e.g., Bachmann, Berg, and Sims 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 the nominal interest rate constant, an increase in inflation will reduce the real interest rate.[3] As a result, an increase in the expected inflation rate will make it attractive for consumers to borrow more (or save less).

We note that, due to the log-log functional form, our model is limited in capturing the role of income effects. With log-log utility, the intertemporal substitution effect mechanically dominates any income and wealth effects. However, with a more general utility function, such as Constant Relative Risk Aversion, wealth and income effects could dominate, leading to an immediate decrease in consumption in response to inflation (see D'Acunto, Malmendier, and Weber 2023). In Internet Appendix B, we demonstrate that in this case the sign of the change is theoretically ambiguous.[4]

[3] 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.

[4] The log-log form also does not allow for differing elasticities of substitution across durable and perishable goods. By relaxing this assumption, durable goods can become more sensitive to income effects than perishable goods, which could explain variations in inflation and exchange rate pass-through between different types of goods.

2 Background

2.1 Setting and sample

We conducted a natural field experiment with credit card customers from a large commercial bank in Malaysia. As a high-middle-income economy, Malaysia's household finance landscape shares a number of characteristics with high-income economies, while in other aspects it is more comparable to emerging economies. Malaysia has a highly developed market for consumer finance. Credit card payments are accepted at most retail establishments and credit card use is widespread. We estimate that credit card spending in our data accounts for approximately 35% of consumers' estimated monthly income, which is comparable to the share of credit card spending in advanced economies. Ganong and Noel (2019), for example, use data from the JP Morgan Chase Institute and find that average credit and debit card spending represented 51% of monthly income in the United States.

The sample for our study consists of individuals who have a credit card with one of the largest banks in the country. Our partner institution is one of the largest commercial banks in Asia and has more than a million retail banking customers in Malaysia. Nearly all of our partner bank's 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 credit card customers are naturally not a representative sample of the population. They are on average younger, more educated, and —given that they must meet the bank's income requirement for a credit card —significantly wealthier than the average customer. Hence, our sample consists of individuals who are quite similar to middle-income consumers in an advanced economy in terms of income, access to finance, and financial experience.

On the other hand, the setting and sample population of our study also have a number of characteristics that are more similar to an emerging economy. Malaysian households hold their wealth in different financial and nonfinancial assets than do households in advanced economies. Stock market participation, for example, is significantly lower and informal savings are more common in emerging economies such as Malaysia than among households with comparable levels of absolute wealth in advanced economies (see Badarinza, Balasubramaniam, and Ramadorai 2019). Malaysian households are also exposed to different types of economic shocks and may have less access to financial tools to mitigate these risks than households in advanced economies. Higher levels of uninsured background risk can amplify precautionary motives in consumption decisions among households in our setting relative to households in advanced economies with similar incomes and total wealth. There may also be systematic differences in discount rates and risk preferences between advanced and emerging economies, reflecting differences in life expectancy and the availability of formal and informal insurance (see Badarinza, Campbell, and Ramadorai 2016).

2.2 Inflation and exchange rates over time

Similar to many central banks in advanced economies, the Malaysian central bank, Bank Negara Malaysia, follows a mandated 2% inflation target. Its main policy instrument is changes in the

overnight policy rate.[5] The central bank communicates the rationale behind rate changes as well as its future outlook through monetary policy statements, which are presented to the public every 2 months. Hence, as in the United States and Europe, forward guidance and the management of market expectations are important goals of central bank communication. As in other small open economies, monetary policy in Malaysia has important implications for the foreign exchange rate. Malaysia has had a fully floating exchange rate regime since 2016. The Malaysian central bank has a price stability mandate but no exchange rate target. As a result, inflation has been moderate and stable over the past two decades, while the exchange rate has experienced episodes of significant volatility, as shown in Figure 2, which plots inflation and the exchange rate over time.

The figure shows the evolution of inflation and the exchange rate over the last 4 decades. 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% per year. In turn, 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 the exchange rate is characterized by sharp changes at shorter time intervals. The exchange rate was most volatile during the Asian financial crisis that began in 1997. In 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 and had a managed float between 2006 and 2016. 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.

2.3 Salience of inflation and exchange rates

How important are inflation and exchange rates to consumers in our setting? 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 more salient and plays a larger role in consumer decisions than the rate of inflation. As our theoretical framework in Section 1 highlights, consumers can partially offset the effect of higher inflation by shifting their consumption toward 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%, 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 more significantly affected by exchange rate fluctuations. For example, if a consumer expects a 25% exchange rate depreciation, the timing of their purchase could lead to significant savings.

To examine whether, in our context, changes in the exchange rate are in fact more salient to households than changes in the inflation rate, we exploit data on online searches and newspaper articles. Figure 3 shows data from Google Trends that track the frequency of online searches for specific keywords. These data have been used in several previous studies to measure public interest in specific

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

topics (see, e.g., Perez-Truglia 2020). Figure 3 (a) shows the frequency of online searches related to the terms "inflation" and "exchange rate": dark bars correspond to keywords related to inflation and lighter bars correspond to keywords related to the exchange rate.[6] 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 for the exchange rate than searches related to inflation.[7]

This pattern is supported by a comparison of newspaper articles that mention 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.[8] 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 those that mentioned the inflation rate. The two different data sources indicate that, relative to the inflation rate, there is both a higher demand and a higher supply of news about the exchange rate.

3 Research Design

3.1 Overview

Our intervention is designed as an information provision experiment in which participants receive information about inflation, the exchange rate, or both. This design, in which all participants receive information about at least one macroeconomic variable, enables us to explicitly measure, and account for, cross-learning effects.[9] Beyond ruling out bias in the treatment effect estimates, measuring cross-learning is also of independent interest in our setting. Testing whether information about the exchange rate causes respondents to update about inflation, for instance, can shed light on beliefs about exchange rate pass-through, which is an important consideration in many emerging economies.

The experiment is administered through a phone survey with our partner bank's credit card customers. In addition to survey data, we use administrative data from our partner bank, which allows us to observe the universe of pre-treatment and post-treatment credit card transactions for all participants of our study. Figure 1 provides a summary of the research design. The intervention proceeds in the following four steps. First, all respondents are asked a set of standard questions about 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 consump-

[6] Google reports online searches only in relative terms. We therefore normalize the data so that the nominal exchange rate takes the value 100 in the first period.

[7] The 2019 data cover the period when our experiment was conducted and are similar to other years.

[8] *The Star*, whose archive is available at www.thestar.com.my.

[9] Experimental designs without a pure control group have been used widely in information provision experiments that provide information about more than one outcome. Cavallo, Cruces, and Perez-Truglia (2017) and Bottan and Perez-Truglia (2025) use designs with and without a pure control group within the same study and find that the results do not differ. See also Haaland, Roth, and Wohlfart (2023) for a review.

tion in the manner predicted by economic theory. We provide additional details on each of these steps in the following sections.

3.2 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 3 years. We received a random sample of 33,000 credit card customers and invited these customers to participate in a phone survey that 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 work day, operators were provided with a randomly selected list of credit card customers to call. The operators introduced themselves as surveyors working on behalf of a team of university researchers 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.

3.3 Information experiment

The survey instrument, which is available in Internet Appendix E, 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. We outline each component of the intervention below.

Background information. We begin with a set of standard questions on the respondent's socioeconomic 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 a 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, e.g., Bachmann, Berg, and Sims 2015; Fuster et al. 2022).

Elicitation of prior beliefs. Next, we elicit the participants' inflation and exchange rate expectations at two points in time: immediately before the treated individuals receive information from the experimenter (prior beliefs) and after a randomly chosen subset of respondents receive 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 rate of inflation and the 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 ask for the respondent's expected inflation for the following 12 months.[10] 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.[11] Participants are asked to give their response in percentage points.

As documented in Section 2.1, the nominal exchange rate is already prominent in the 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 about 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 (e.g., Cavallo, Cruces, and Perez-Truglia 2017) and was adapted to our research setting through a series of pilot tests and consumer interviews.

Information provision. In the information provision stage of the experiment, all respondents first receive 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 both of the signals described above (that is, one about the inflation rate and the other about the exchange rate). The order of these two pieces of information was consistent with the (randomized) order of the questions on prior beliefs.[12]

Expert forecasts of inflation and the exchange rate used in the experiment were obtained from widely used forecast websites and updated once throughout the course of the experiment to reflect a quarterly forecast revision.[13] Figure IA.1 in the Internet Appendix reports information about the

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

[11] 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 of how these differences in language 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 have used the Michigan Survey of Consumers data.

[12] For instance, if the prior inflation expectations were elicited before the prior exchange rate expectations, then feedback about inflation would come before the feedback about the exchange rate.

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

historical precision of the forecasts provided to subjects 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 pp for inflation (0.97 pp when excluding an outlier during the pandemic) and 0.39 pp for the exchange rate.

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.

We take several steps to minimize potential experimenter demand effects.[14] First, we follow the best practice of not incentivizing guesses of posterior beliefs.[15] Second, callers were instructed to introduce themselves as representatives of a research team conducting a survey for a university, not as representatives of the bank. Third, we employ neutral language in the elicitation exercise that asks respondents whether they wish to revise their initial guess, without making any statements about the information or whether the surveyor agrees or disagrees with the expert forecast. We additionally test for the presence of experimenter demand effects by comparing updating in the main experiment, conducted over the phone, and the follow-up experiment, conducted as an online survey. We find no meaningful differences in the general pattern of updating and results between the two experiments.

Elicitation of consumption plans. Although 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' self-reported consumption plans. These responses were collected after the elicitation of posterior beliefs and 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 serve as benchmarks.

The first of these questions elicits the expected change in total credit card expenditures (which corresponds to the total expenditures that we observe in the 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 outcome 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 (i.e., 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 language 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

[14] See also de Quidt, Haushofer, and Roth (2018), who measure experimenter demand in several basic survey tasks and show that typical experimenter demand effects in these settings are modest.

[15] Otherwise, if we rewarded individuals based on how closely their responses matched expert forecasts, they would have a strong financial incentive to simply repeat the information provided to them, even if they disagreed with it.

furniture or a refrigerator?" We code responses using the same $\{-1, 0, +1\}$ scale: that is, the outcome takes the value -1 if it is a bad time, 0 if it is neither a good nor a bad time, and $+1$ if it's a good time. We include three additional questions using the same language and scale, 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 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. The survey includes two questions to shed light on this potential mechanism. The first question asks respondents whether they expect the Malaysian economy to be better off, worse off, or about the same 12 months from now, the second question asks whether respondents expect their own financial situation to be better, worse, or about the same 12 months from now. We code both outcomes using the usual scale: -1 if the individual responds "Worse off," 0 if the individual responds "About the same," and $+1$ if the individual responds "Better off."

4 Data and Descriptive Statistics

4.1 Sample and survey implementation

We implemented the experiment over a 4-month period between April and July 2019. During this time, members of the survey team attempted to reach 28,958 credit card customers and completed 2,872 phone surveys, implying a response rate of 10%.[16] The survey team used the internal records of the partner bank to ensure that the phone numbers of respondents could be matched to the bank's administrative data. Before starting the survey, members of the survey team also verified the name of the respondent and confirmed that they were debit or credit card holders at our partner bank. The surveys were offered in English and Malay and 47% of the respondents chose to complete the survey in English, while the remaining 53% responded in Malay. Because our survey experiment was integrated into the bank's regular customer outreach program, which has no provision for incentivizing respondents, participants were not compensated for their time. The respondents were asked if they wanted to participate at the beginning of the interview and could opt out of the survey at any time.[17] The partner bank shared anonymized administrative records for all survey respondents, as well as a representative sample of clients who were invited to the survey but did not respond.

Table 1 provides descriptive statistics based on administrative data. Column (1) reports data for

[16] 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 MYR per US$) 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 data on expectations (see, e.g., Fuster et al. 2022).

[17] 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.

a random sample from the universe of the bank's credit card clients, which includes both survey respondents and nonrespondents. In this sample, 62% of the customers are male, they are on average 33.6 years old, have an average monthly income of $3,088 and monthly credit card expenditures of $1,070. Unless otherwise noted, all monetary amounts are expressed in U.S. dollars, converted from MYR to US$ using the exchange rate of 4.05 MYR per US$ as of April 1, 2019. As expected, the summary statistics shown in column (1) of Table 1 indicate that the subject pool is not fully representative of the Malaysian population. On 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, the average Malaysian household earned $1,767 (compared to $3,088 in our sample).

However, Table 1 also shows that, within this sample, customers who responded to our survey are similar to nonrespondents. Columns (2) and (3) compare the characteristics of the 2,872 clients who answered our survey (reported in column (2)) with the sample of 3,126 clients who were invited to the survey but did not respond (reported in column (3)). Comparing columns (2) and (3) indicates that, although there are some statistically significant differences in average characteristics, none of these differences are meaningful in magnitude. For example, the average age is 33.28 years among survey respondents compared to 33.88 among nonrespondents. The average monthly income is $3,128 among survey respondents compared to $3,049 among nonrespondents. The average credit card expenditures are $1,095 among survey respondents and $1,046 among nonrespondents. The one possible exception is gender, where we find that men are more represented among survey respondents (67%) than among nonrespondents (57%).

Table 2 provides additional descriptive statistics, based on survey and administrative data, and presents a test of randomization balance. Column (1) reports descriptives on all 2,872 survey respondents. The summary statistics show that the respondents in this sample are highly educated (87% have a college degree), about half (54%) are married, and around 10% are self-employed. In columns (2) through (4) of Table 2, 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 on average the same between the three treatment groups. The results indicate that, consistent with successful random assignment, pre-treatment observables are balanced across treatment groups. As expected, all differences between treatment groups are economically small. The difference is statistically significant for only 1 of the 11 characteristics reported in the table: the number of dependents (p-value=0.093). This result is within expectations, as 1 in 10 differences is 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.

4.2 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 the spending and borrowing behavior for 12 months prior to the

intervention and 3 months after the intervention. The data set 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.[18] The credit card data also include information about outstanding balances and repayment, which we use to measure consumers' willingness to take on debt. Significant for our purposes, each transaction in the data contains the standardized Merchant Category Code (MCC), a four-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 purpose 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, Agarwal, and French 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 nontradable expenditures. We therefore created our own categorization by manually inspecting each individual MCC and classifying it as tradable or nontradable. We follow the 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, but only if they can be imported or exported. Examples of tradable spending items include apparel and consumer electronics.[19]

Figure 4 summarizes the breakdown of spending between durable and tradable categories. Each rectangle corresponds to one unit of spending. The blue rectangles to the right, denoted uncategorized, correspond to 10% of spending that cannot be classified. Among the transactions that can be classified (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 1 reports the average spending for the categories used in our analysis. Specifically, participants in our experiment spent a monthly average 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 $1,746 in outstanding credit card debt, equivalent to approximately 1.5 months of total spending.

4.3 Spending: Survey versus administrative data

Because we observe self-reported spending plans and administrative data on actual spending, we can shed light on the correlation between survey measures of consumer spending and actual spending.

Existing research has generally studied the effect of economic expectations on consumption using survey data, which may suffer from a number of well-known limitations, such as measurement error,

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

[19] We report summary statistics on spending by category using standard groupings of MCCs that are commonly used by financial institutions and in the academic literature in Internet Appendix Table IA.1.

selection problems, and experimenter demand effects. If survey measures of consumption closely track actual consumption, measuring consumption in administrative data has few benefits. However, if there is a disconnect between survey responses and actual spending, this would suggest that the use of administrative data could be crucial to avoid misleading results.

Our data enable us to test this question empirically. In our survey, we elicited expectations of 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 with actual spending can reveal the extent to which survey measures predict actual consumption. We find a marginally statistically significant relationship (p-value = 0.022) between the expected change in credit card expenditures and the actual change in spending, indicating that self-reported consumption plans carry some significant information. However, this relationship is weak: the estimated slope (0.051) implies that a one standard deviation increase in future expenditures is associated with an increase in expected future expenditures of only 0.03 standard deviations.[20] This is also highlighted by a low R-squared of 0.022. These results indicate that survey predictions are a potentially useful but weak indicator of actual future spending.

5 Main Results

5.1 Prior beliefs

We first examine the distribution of prior beliefs and then turn to the effect of our information treatments on macroeconomic expectations. Figure 5 shows the distribution of inflation and exchange rate expectations at baseline. In Figure 5 (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).[21] There is, however, significant dispersion in expectations, with individuals in the 10th percentile predicting an inflation rate of 0 pp and individuals in the 90th percentile predicting an inflation rate of 10 pp. In Figure 5 (b), we plot the distribution of exchange rate expectations. The figure shows that beliefs about the future exchange rate follow a similar pattern to those for the future inflation rate: prior expectations about the nominal exchange rate are centered close to the expert forecast with a mean of 4.13 and median of 4.10 MYR per US$, but there is significant dispersion across individuals, with individuals in the 10th percentile expecting the exchange rate to decrease to 3.90 MYR per US$ and individuals in the 90th percentile expecting it to increase above 4.40 MYR per US$. The general pattern that expectations are centered on the professional forecast, but dispersed, has been widely documented in the literature on inflation expectations (Armantier et al. (2016); Cavallo, Cruces, and Perez-Truglia 2017), as well as in other contexts (see, e.g., Fuster et al. 2022).

[20] This relationship is shown in Internet Appendix Figure IA.2.

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

5.2 Effect of information on posterior beliefs

Next, we 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, Cruces, and Perez-Truglia 2017), cost of living (Bottan and Perez-Truglia 2025), and housing prices (Fuster et al. 2022). 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).[22]

Let subscript i index the participants in our experiment and denote $\pi_{i,t}^{prior}$ as individual i's prior belief in month t about the future inflation rate from month t to month $t+12$. 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 was provided with 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 belief updates ($\pi_{i,t}^{post} - \pi_{i,t}^{prior}$) should be a 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 telephone 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 mitigate concerns of spurious updates, we take advantage of randomized assignment from the information provision experiment, following a standard specification in the literature on misperceptions (see e.g., Cavallo, Cruces, and Perez-Truglia 2016):

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

[22] We find learning rates of 0.47 and 0.32 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 ranges from 0.08 to 0.88.

In this specification, the parameter β picks up spurious reversion toward 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 their posterior beliefs toward the signal we provided ($\alpha = 1$) because the signal is an expert forecast that most of the respondents will correctly interpret as having some uncertainty. Moreover, some individuals may not fully trust the source of the forecast and therefore place lower weight on the forecast. However, we 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 the prior belief of participant i 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 for people to 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:

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

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

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 same set of standard controls in all regressions presented in this paper: gender, age, age squared, number of dependents, household size, education, log income, as well as week fixed effects, surveyor fixed effects, and controls for pretreatment spending in regressions where the dependent variable measures total spending or spending in a specific category. The main parameters of interest are α_1, which measures how individuals incorporate feedback on inflation into their inflation expectations, and α_4, measuring how individuals incorporate feedback about the exchange rate into their exchange rate expectations. Parameters α_2 and α_3 measure cross-learning. That is, they capture how individuals incorporate exchange rate

feedback into their inflation expectations and inflation feedback into their exchange rate expectations.

Before presenting the regression results, Figure 6 provides a graphical summary of the effect of our information treatments on macroeconomic expectations. Figure 6 (a) shows a binned scatterplot corresponding to the effects of 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 some evidence of spurious learning, which is consistent with findings from related studies (see, e.g., Fuster et al. 2022; Cullen and Perez-Truglia 2022).[23] In turn, the red squares correspond to the treatment group (that is, individuals who receive inflation feedback). Most importantly, the slope of the relationship is significantly larger (p-value<0.001) in the treatment group (0.471) than in the control group (0.247). This difference in slopes corresponds to the coefficient α from Equation (3), that is, the true rate of learning that can be attributed to the provision of information. Figure 6 (b) is similar to Figure 6 (a), but reports updating exchange rate expectations instead of inflation expectations. Again, consistent with real learning from feedback, we find that the slope is stronger in the treatment group than in the control group, although the difference is somewhat weaker in magnitude (0.317 vs. 0.254) and statistical significance (p-value<0.001).

Next, we turn to the regression results, presented in Table 3. The first two columns of the table correspond to the regression specifications given by Equations (4) and (5), respectively. In column (1), the dependent variable is the update on inflation expectations. In column (2), the dependent variable is the update on the expected exchange rate depreciation. These results differ from the simpler binned scatterplots in Figure 6 in that they include additional control variables and allow for cross-learning. Table 3 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 3 indicates that providing information about inflation has a significant effect on inflation expectations. More precisely, a 1 pp increase in inflation shock increases inflation expectations by 0.235 pp (p-value<0.001). The magnitude of pass-through from 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 (2025) shows that an increase in feedback on future home prices by 1 pp increases 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, Cruces, and Perez-Truglia (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

[23] 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 by phone. As a result, some participants may have felt pressured to revise their posterior beliefs even if they did not receive any feedback.

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 learning rates could be attributed to differences in 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. In addition, other studies where participants are paid to complete the survey could generate experimenter demand effects. In contrast, the participants in our survey were not compensated for their participation.

The second coefficient in Table 3, 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 approximately 0.066 pp (p-value=0.035). We find that the magnitude of learning effects for the exchange rate is lower than the magnitude of learning effects for inflation, and the difference between the two coefficients is statistically significant (p-value=0.026). In light of the Bayesian learning model, we offer two possible interpretations of 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 2.1 that there is substantially more interest in learning about the exchange rate than the rate of inflation, presumably because it is more consequential for everyday economic decisions.

The results in Table 3 also reveal the rates of cross-learning. The second coefficient from column (1) of Table 3 is close to zero (-0.029) and statistically insignificant (p-value=0.210), 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 cross-learning coefficients for exchange rate information are also of independent interest because they allow us to measure beliefs about exchange rate pass-through, which is an important consideration in many emerging economies. The first coefficient in column (2) is close to zero (0.028) and statistically insignificant (p-value=0.280), indicating that individuals learn in a compartmentalized way. That is, information about the inflation rate does not have a significant effect on participants' exchange rate expectations. In this context, the lack of cross-learning does not imply that subjects are naive, given that several studies of the Malaysian economy have consistently found relatively low exchange rate pass-through to domestic inflation (see, e.g., Bank Negara Malaysia 2015, 2022).

5.3 Effect of information on spending

Having shown that our information treatments are effective at shifting beliefs, we turn to their effects 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 (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. We include the pre-treatment spending in the set of control variables ($X_{i,t}$), which exploits the persistence in spending patterns and improves statistical power (see McKenzie 2012).

Table 3 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 3, 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 repayment, 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. Debt repayment is the amount of debt repaid over the same period.

The results in columns (3) through (5) of Table 3 test the key predictions of the theoretical framework presented in Section 1. 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. Although the point estimate has the predicted sign, the coefficient is small in magnitude (1.023) and is not statistically different from zero (p-value=0.717). The information shock delivered by our experiment moves inflation expectations by an average of 0.087 standard deviations, but our estimate implies that it increases average monthly spending on durables by only 0.003 standard deviations.

The second coefficient estimate in column (4) of Table 3 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 (-1.267), and not statistically significant (p-value=0.506). Although our intervention moves exchange rate expectations by an average of 0.023 standard deviations, this coefficient estimate implies a negligible effect on spending on tradable durables, shifting expenditures in this category by only 0.005 standard deviations.

In column (5) of Table 3 we report treatment effects on debt repayment. The results show that, contrary to Proposition 3, an increase in the expected inflation rate leads to a small increase in debt repayment, which implies a reduction in total credit card debt. However, the coefficient is statistically insignificant and small in magnitude: it implies that for each 1 pp increase in the inflation shock, credit card debt repayment increases by just 0.003 standard deviations. In contrast, an increase in expected exchange rate depreciation leads to a reduction in debt repayment. However, this effect, although statistically significant, is again quantitatively small in magnitude at $-$\$15.91 or 0.016 standard deviations of the outcome.

In Table 3, column (6), we consider the effect of inflation and exchange rate expectations on total

spending. As argued by Coibion, Georgarakos, Gorodnichenko, and Van Rooij (2023), 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 exchange rate depreciation may discourage spending for precautionary reasons. To explore this additional hypothesis, column (6) of Table 3 uses total expenditure as the dependent variable. We do not find evidence that inflation and exchange rate expectation shocks have significant effects on total spending. In both cases, the coefficients are negative, economically small and statistically insignificant. For example, a 1 pp inflation shock reduces total spending by \$4.4 or 0.005 standard deviations (p-value=0.429), while a 1 pp depreciation shock reduces total spending by \$7.5 or 0.008 standard deviations (p-value=0.147).

We note that our results on total spending differ from those of contemporaneous work on inflation expectations. Coibion, Gorodnichenko, and Weber (2022), for example, find a large and statistically significant positive effect of inflation expectations on total spending over the same time horizon. This is likely due to differences in the sample population. Coibion, Gorodnichenko, and Weber (2022) use data from households in the Nielsen scanner panel, who are instructed to actively monitor their spending in real time, which makes price information more salient and could modify the response to inflation information. In contrast, we observe actual spending in credit card transaction records among individuals who are not aware that their spending is being observed. Our results are very similar to those in Coibion, Gorodnichenko, and Weber (2022) for other outcomes, such as spending on durables, which are measured using surveys instead of scanner data.

As an additional robustness check, we ensure that the treatment effects for inflation and exchange rate expectations are comparable in the sense that they represent the effect to an information shock of similar magnitude. To do so, we first note that Figure 6 illustrates that the distribution of the information shock is similar between the two variables. In Internet Appendix Table IA.3, we additionally replicate our main results, restricting the sample to observations for which the signal shock distributions have common support. We show that this does not change our findings.

We additionally explore heterogeneity of treatment effects by income. Intuitively, one would expect higher-income households to show different substitution patterns in response to macroeconomic expectations for a number of reasons (see D'Acunto, Malmendier, and Weber 2023). They may, for example, have different consumption bundles at baseline or be less sensitive to expected income changes. We test income effects by comparing the spending response for households with above and below median income in Internet Appendix Table IA.4 and find suggestive evidence that lower income households in our sample have slightly larger deviations from standard Euler equation substitution than higher income households. The difference is, however, not statistically significant due to sample size limitations and because our sample consists of credit card holders who are relatively homogeneous in terms of income.

5.4 Magnitude of coefficients

In the previous section, we showed that our information treatments shift expectations, but do not have a statistically significant effect on spending. However, this does not necessarily mean that the effects are precisely zero. To put bounds on the plausible effect sizes, we inspect the confidence intervals

around our estimates.

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. To estimate the treatment effect on the treated, we follow the literature on information provision experiments that uses an instrumental variable (IV) model (see, e.g., Cullen and Perez-Truglia 2022). In this model, the endogenous variables are the belief updates for inflation expectations and exchange rate expectations, and the excluded instruments are the two information shocks—one for inflation and the other for exchange rate.

We report the results of the instrumental variables model in Table 4. We first examine the upper bound for our inflation expectations estimates. The point estimates are similar in magnitude to the reduced-form estimates. For a 1 pp change in inflation expectations, the point estimate for spending on durables is small and positive (5.741) and the upper bound of the 95% confidence interval rules out an increase of more than $30 (0.088 standard deviations or 25% of the median). The point estimate for tradable durables is similarly small and positive (7.554) and the 95% confidence interval rules out an increase of more than $25 in monthly spending (0.1 standard deviations or 36% of the median). We next inspect the upper bound for the effect of inflation expectations on debt repayment. The estimate indicates that we can rule out an increase in debt repayment larger than $66 (0.07 standard deviations, or 0.1% of the median). Turning to total spending, the instrumental variables point estimate is negative and larger in magnitude than the reduced form estimate (-15.324) and we can rule out an increase in monthly spending of more than $29 (0.032 standard deviations of the outcome, or 4.6% of the median).

We then inspect the upper bound of the effect sizes for exchange rate expectations. Because the first stage F-statistic is small in the case of exchange rate expectations, we use Anderson-Rubin standard errors to construct the confidence intervals but note that the upper bounds for exchange rate expectations should be interpreted with caution. We find that, for a 1pp change in depreciation expectations, the instrumental variables point estimate for spending on durable goods is negative and larger in magnitude than in the reduced-form estimation (-55.536). The confidence interval suggests that we can rule out an increase in spending larger than $28 (0.08 standard deviations of the outcome, or 24% of the median). For spending on tradable durables, the point estimate is again negative (-22.783) but the 95% confidence interval is wider and allows us to rule out an increase in spending of more than $55 (0.22 standard deviations of the outcome). We then inspect the confidence interval for debt repayment and find that both the point estimate and upper bound are negative and rule out an increase in debt repayment in response to heightened depreciation expectations. Turning to total spending, the point estimate is also negative (-113.051) and we can rule out an increase in total spending of more than $36 (0.04 standard deviations of the outcome, or 0.06% of the median). Based on these estimates, we argue that we can rule out anything other than a modest increase in spending both in absolute terms and relative to the distribution of the outcome.

To address any potential concerns about weak-instrument bias, we additionally report tF confidence intervals (Lee et al. 2022) in Internet Appendix Table IA.5. As expected, the confidence intervals

using this procedure are wider and do not allow us to rule out relatively substantial positive treatment effects for exchange rate expectations. However, in the case of inflation expectations, the tF confidence intervals rule out meaningful increases in spending in response to heightened inflation expectations. The tF upper bound for durables spending, for example, allows us to rule out an increase of more than \$25 (0.07 standard deviations, or 21% of the median). For total spending, we can rule out increases greater than \$80 (0.09 standard deviations, or 0.08% of the outcome median).

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 modest 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 5 presents the results. The results reported in the table correspond to the ordinary least squares equivalent of the instrumental variable regressions reported in Table 4. There is a simple trade-off between these two approaches. On one hand, experimental estimates provide a 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 are qualitatively consistent across the two approaches: the estimated effects of expectations on behavior are close to zero and statistically insignificant. However, the OLS estimates from Table 5 are substantially more precisely estimated than the corresponding IV estimates from Table 4. As a result, the nonexperimental estimates can rule out even smaller effects. Take, for example, the effect of inflation expectations on durable consumption. According to the coefficient in column (1) of Table 5, a 1 pp increase in inflation expectations is associated with a reduction in durable expenditures of less than \$3. If we take the upper bound of the 95% confidence interval, we can rule out increases in durable expenditures above \$2.9, which is equivalent to 0.009 standard deviations of the outcome or 0.03% of the median and thus an arguably negligible effect. In summary, both experimental and nonexperimental data support the conclusion that our estimates provide evidence of null or small effects of macroeconomic expectations on spending behavior.

6 What Explains the Absence of a Spending Response?

In this section, we explore several candidate mechanisms that might explain why changes in macroeconomic expectations induced by the information experiment do not translate into changes in spending patterns in the direction predicted by a simple model of intertemporal consumption.

We first describe a survey experiment that allows us to present additional tests and then combine the results from the main experiment and the survey experiment to narrow down the causal mechanism behind our main result. The combined evidence suggests that the spending response to macroeconomic information is dampened by the anticipation of nominal rigidities. That is, consumers understand that wage indexation is imperfect, which causes them to interpret an increase in inflation or a depreciation of the exchange rate as a negative income shock and to reduce spending

for precautionary reasons. We first review evidence consistent with this mechanism and then test and rule out several alternative mechanisms that could explain our results.

6.1 The mental model experiment

We conducted an additional mental model survey experiment to test several candidate mechanisms that might explain the lack of a spending response in our main experiment. The survey was administered to a population of Malaysian credit card holders for whom we have demographic data and self-reported spending plans, but no information on actual credit card spending. The experiment elicits responses to various exchange rate and inflation scenarios while also randomizing: (a) whether expected nominal income is held constant and (b) measuring the financial sophistication of the respondents.

In the first step of the survey experiment, we elicit each participant i's prior beliefs about inflation π_i^{prior} or the exchange rate d_i^{prior}, using the same approach as in our main experiment. In the second step, we elicit respondents' plans in three hypothetical scenarios. In the baseline scenario, participants are asked to assume that both inflation and the exchange rate occur as expected based on their prior beliefs. In the shock scenarios, participants consider situations where either inflation or the exchange rate deviates from their prior beliefs by a randomly assigned percentage change (Δx_i^k), which takes one of the values -10, -3, 3, or 10. Specifically, respondents are asked to consider a realized value of either $\pi_i^{prior} + \Delta x_i^k$ for inflation or $d_i^{prior} + \Delta x_i^k$ for the exchange rate. The baseline scenario is always presented first, while the order of the inflation shock and exchange rate shock scenarios is randomized between participants. For each scenario, we ask participants about their spending plans and elicit their demand for inflation-indexed securities. Finally, we include a brief survey module measuring basic indicators of financial literacy, which we do not observe in the main experiment.[24] We combine evidence from the mental model exercise with results from our main experiment to test alternative mechanisms that could explain the absence of a spending response to changes in macroeconomic expectations.

We present results from the supplementary survey experiment in two steps. Table 7 reports the planned expenditure patterns in response to the information shocks provided in the experiment, for the whole sample and by financial literacy. The results are qualitatively similar to those of the main experiment, indicating that the same substitution patterns hold in different populations of credit card customers. In Table 8, we report the effect of information shocks in the supplementary survey experiment on the demand for inflation-indexed assets.[25]

6.2 The nominal rigidities mechanism

We begin by examining the possibility that the absence of a spending response is due to the anticipation of nominal rigidities. Specifically, consumers recognize that wage indexation is imperfect,

[24] We find that, overall, financial literacy in our study population is relatively high. For example, 58.5% of the respondents are able to answer at least two of the standard "big three" financial literacy questions (Lusardi and Mitchell 2011) correctly.

[25] We also explore heterogeneous treatment effects in the demand for inflation-indexed assets and report the results of this exercise in Internet Appendix Tables IA.13 and IA.14.

leading them to interpret an increase in inflation or a depreciation of the exchange rate as a negative real income shock. This perception counteracts the standard Euler equation substitution effect and dampens the spending response to macroeconomic information.

We present two main pieces of evidence that support this mechanism. First, we demonstrate that consumers in our study are sophisticated enough to understand how inflation and exchange rate fluctuations affect their real income. Second, we report heterogeneous treatment effects, showing that deviations from standard Euler equation substitution are more pronounced among individuals in occupations with a higher degree of nominal wage rigidity and among consumers who are more exposed to foreign currency fluctuations at baseline.

We first present evidence that consumers understand the effect of inflation on their real income using evidence from the survey experiment. In one arm of the mental model experiment, participants were asked if they would be interested in buying an asset indexed to inflation or the exchange rate. The results, reported in Table 8, show that consumers with large updates in their inflation and exchange rate expectations have substantially higher demand for the indexed asset. This result holds in the main survey experiment, as well as in an extension where respondents were explicitly told to assume that their nominal income would remain unchanged. We report results from this extension in Internet Appendix Table IA.15. The fact that demand for indexed securities is not reduced by the fixed income condition supports the hypothesis that consumers reduce spending in anticipation of nominal rigidities. This result resonates with the hypothesis proposed in Christiano, Eichenbaum, and Evans (1999) that, when making consumption decisions, consumers care about the wage Phillips curve rather than the price Phillips curve. It is also consistent with recent work that finds a low pass-through from inflation expectations to income growth expectations (see Hajdini et al. 2022).

We provide additional direct evidence in support of this channel by examining treatment effects for individuals in occupations with higher degrees of wage rigidity and for those who are more exposed to exchange rate fluctuations at baseline, using data from our main experiment. If a nominal rigidity channel is at play, we would expect deviations from Euler equation optimization to be most pronounced in these two groups, as they are likely to anticipate a larger negative real income shock as a result of rising inflation or a depreciation of the local currency.

To examine this hypothesis, we first split the sample into salaried employees, whose wages we assume to be relatively inflexible, and self-employed individuals, who are presumed to have greater nominal wage flexibility in response to macroeconomic events. The results are reported in Internet Appendix Table IA.6. The point estimates suggest that salaried employees do indeed reduce spending more in response to heightened inflation and exchange rate depreciation expectations. However, because the sample of self-employed individuals is relatively small, we cannot statistically distinguish the effects of the two groups.

Next, we use the credit card transaction data to identify another occupational group that plausibly faces less wage rigidity than wage employees: transportation workers, which include taxi drivers, truck drivers, delivery workers, and related occupations. We report heterogeneous treatment effects for this group in Internet Appendix Table IA.7 and find evidence that salaried employees, whom we assume to face greater nominal wage rigidity than transportation workers, exhibit greater deviations

from the substitution patterns predicted by a standard Euler equation model. In all cases, the difference in the treatment effects between wage employees and transportation workers is in the expected direction. In the case of inflation expectations, the differences in treatment effects on durables and total spending are statistically significant at the 5% level.

To provide additional evidence in support of a nominal rigidity mechanism, we examine treatment effects for individuals who are more exposed to foreign currency fluctuations at baseline. The results are presented in Internet Appendix Table IA.8. In line with the hypothesis that those who are more exposed to foreign currency depreciations will interpret a depreciation of the local currency as a negative real income shock, we find that reductions in overall consumption are larger for individuals who have foreign currency spending at baseline. The difference is statistically significant at the 10% level for tradable durables and total spending.

6.3 Ruling out other mechanisms

We next examine several mechanisms other than nominal rigidities that could explain our results and can be tested with data from our two experiments.

Time inconsistency. First, 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 due to self-control issues. 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 effect on these plans. We estimate Equation (6) using self-reported spending plans measured post-treatment as the dependent variable. We find that individuals do not change their self-reported spending plans in response to new information on inflation or the exchange rate, as shown in Table 6. The treatment effects are close to zero and statistically insignificant for all spending plan outcomes, indicating that the inflation and exchange rate shocks generated by our experiment do not cause participants to change their spending plans. This rules out time inconsistency as an explanation for the absence of a spending response.

Financial literacy. Second, we examine whether the absence of a spending response could be explained by the possibility that consumers are unable to interpret the macroeconomic information that is provided to them, or are not financially literate enough to optimize their spending decisions in response to revised macroeconomic expectations. In fact, substantial evidence suggests that consumers do not optimize in many simpler economic decisions, either due to behavioral biases or lack of knowledge (see Campbell et al. 2011; Beshears et al. 2018).[26]

We present several tests of this hypothesis and show that lack of financial knowledge is unlikely to explain our results. We first show that respondents in our setting update their expectations substan-

[26] News about macroeconomic events may not affect consumer expectations in the first place if consumers are unable to interpret them. Coibion, Gorodnichenko, Knotek, and Schoenle (2023) show evidence of this in the case of the Federal Reserve's announcement of its new average inflation targeting policy.

tially in response to the information provided to them, which rules out the possibility that consumers are entirely unable to interpret the information given to them in the experiment. Moreover, in the supplementary survey experiment, we measure financial literacy directly, using the standard "big three" questions (Lusardi and Mitchell 2011) and examine heterogeneous treatment effects by financial literacy. Table 7, panel A, first confirms that the reaction to anticipated changes in inflation and the exchange rate matches that of our main experiment. Table 7, panel B, reports the results separately for respondents with high (above median) and low (below median) financial knowledge. Interestingly, we find that the negative effects of the high inflation and exchange rate depreciation scenarios on durable consumption, which point to the anticipation of nominal rigidities, seem to be driven entirely by the more financially literate respondents in our sample. This indicates that, rather than the limited financial knowledge that explains the lack of transmission from expectations to actual spending, it is the most financially literate consumers whose substitution patterns deviate the most strongly from the predictions of a standard model of intertemporal choice. This pattern is inconsistent with the explanation that a lack of financial sophistication is driving our results.

Salience of information. Third, it is 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 potential mechanism using data from the main experiment and estimating treatment effects separately for large and small purchases.

To implement this test, 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 cut-offs 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. Internet Appendix Table IA.9 presents the results. We find that the treatment effects are overall close to zero and do not differ by transaction amount.

As an additional test, Internet Appendix Table IA.10 uses a different classification of large and small purchases based on the categories of spending on credit cards in the administrative data that have the largest average transaction sizes. We again find that 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 the insufficient salience of macroeconomic considerations in small transactions is unlikely to explain the absence of a spending response to macroeconomic information.

Inferences about the economy. Fourth, it could be that consumers reduce spending because they associate higher inflation or anticipated exchange rate depreciations with worsening overall economic conditions. To test this possibility, we elicited participants' expectations about the Malaysian economy as a whole and their personal financial situation 1 year from the survey date and test for an effect of our information treatments on these outcomes. The results, presented in Internet Appendix Table

IA.11, show that the information provided in our experiment has no meaningful effect on the personal or overall economic outlook of the participants.

Effect of information over time. Finally, it is possible that the effects of information shocks on expectations are not sufficiently long-lasting to affect consumer decisions. To test this possibility, we first report treatment effects at a shorter (1-month) horizon: as shown in Internet Appendix Table IA.12, there is no meaningful change in the results. This matches evidence from similar experiments, which indicates that participants retain information provided in the context of an information treatment for months after the experiment or even a year later (Cavallo, Cruces, and Perez-Truglia 2017; Bottan and Perez-Truglia 2025). Therefore, it is unlikely that participants simply discard the acquired information when making consumption decisions. Second, we show that information shocks have no effect on spending plans, which we elicit immediately after the information-provision stage of the experiment, when one would expect the information to be fresh and salient.

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 from a large commercial bank. We created exogenous variation in macroeconomic expectations through an information-provision experiment, in which participants received expert forecasts of inflation and the exchange rate. We then measured the effects of these information shocks on consumers' subsequent macroeconomic expectations, self-reported spending plans, and actual spending, as reflected in credit card transaction 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 and find that information provision shifts beliefs but does not change spending behavior as predicted by these models.

We examine several mechanisms that could explain why the significant updates in macroeconomic expectations induced by our experiment do not affect spending. Our interpretation most consistent with our findings is that consumers understand that wage indexation is imperfect and therefore perceive inflation and nominal exchange rate depreciations as a negative real income shock. This counteracts the effects predicted by standard models of intertemporal optimization and accounts for the absence of a spending response. We do not find evidence consistent with alternative explanations such as financial sophistication, time inconsistency, commitment problems, or insufficient salience of macroeconomic information.

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, Berg, and Sims 2015), or they may try to manipulate exchange rate expectations to affect the consumption of foreign goods. Our results suggest that such policies may be 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 between households (Andre et al. 2022) and further complicates the task of predicting the aggregate effects of macroeconomic policies, such as forward guidance, on the real economy.

The replication code and data are available in the Harvard Dataverse at `https://doi.org/10.7910/DVN/FGXMJE`.

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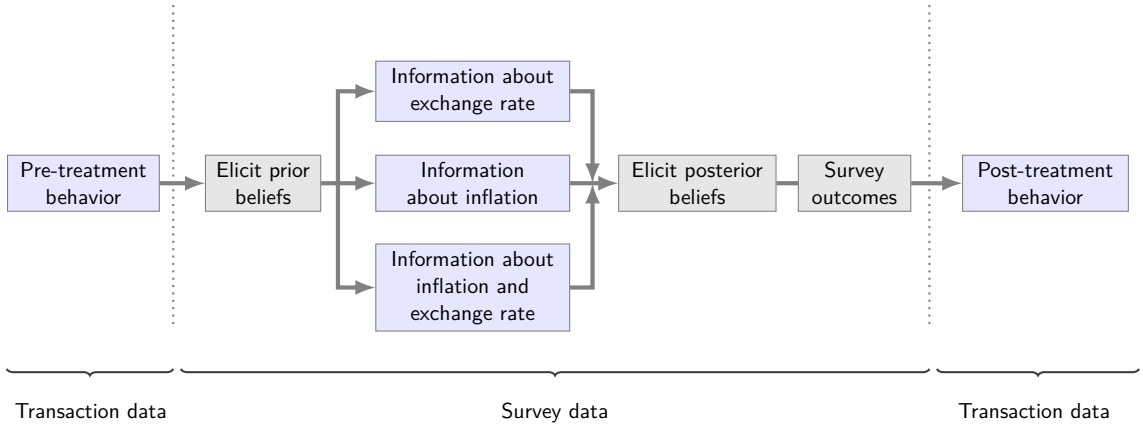


Figure 1: Experimental design

The figure summarizes the treatment conditions and timeline of the information experiment.

Alt Text: Graphical representation summarizing the treatment conditions and timeline of the information experiment and the data generated or utilized at each stage.

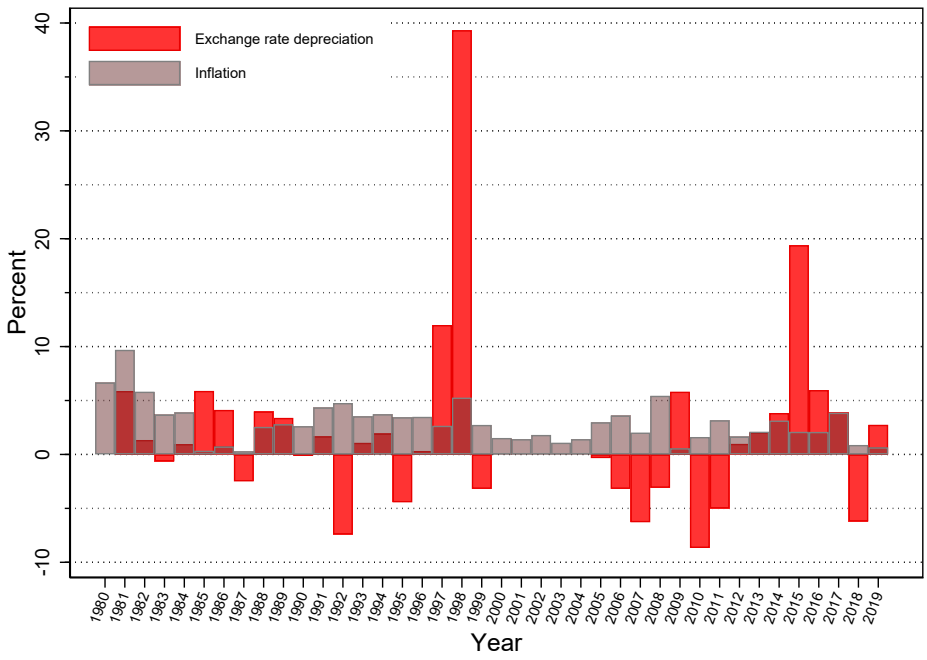
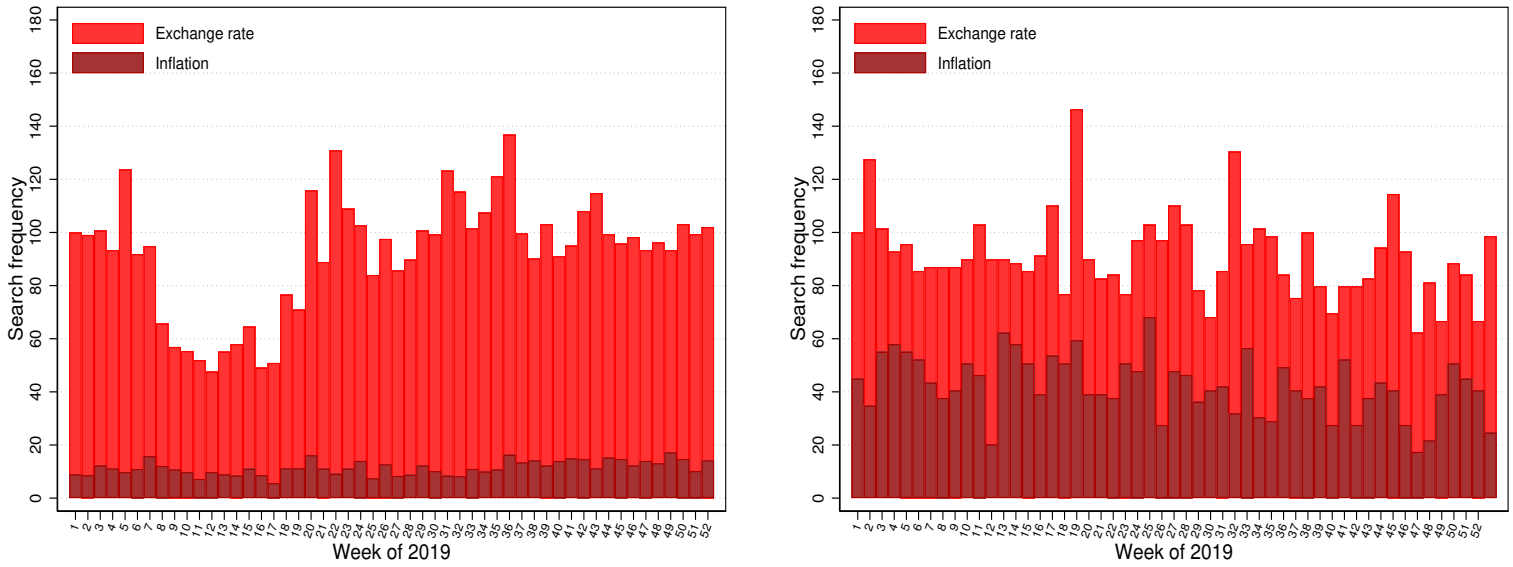


Figure 2: Inflation and nominal exchange rate 1980–2019

The figure shows the time series of the annual inflation rate and 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.

Alt Text: Graph showing the time series of inflation and the nominal exchange rate of the Malaysian ringgit against the U.S. dollar for the period 1980–2019.



(a) *Google searches* (b) *Newspaper articles*

Figure 3: Public interest in inflation and the exchange rate

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).

Alt Text: Bar chart with two panels, showing the frequency of Google searches (in panel (a)) and newspaper articles (in panel (b)) in Malaysia mentioning the terms "inflation" and "dollar" between January and December 2019. The figure shows that terms related to the exchange rate are more common in online searches and more frequently mentioned in newspaper articles.

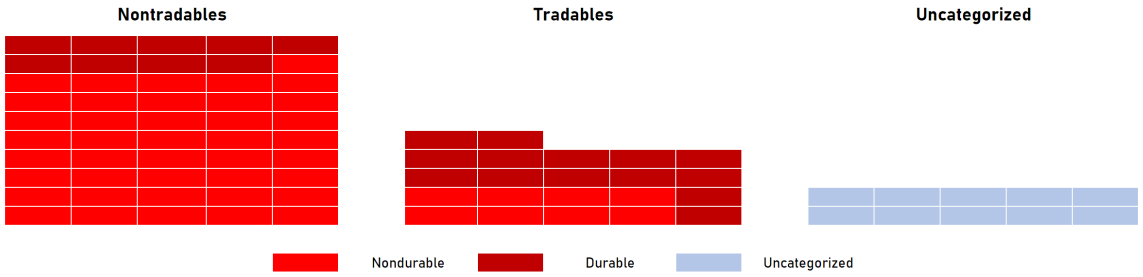
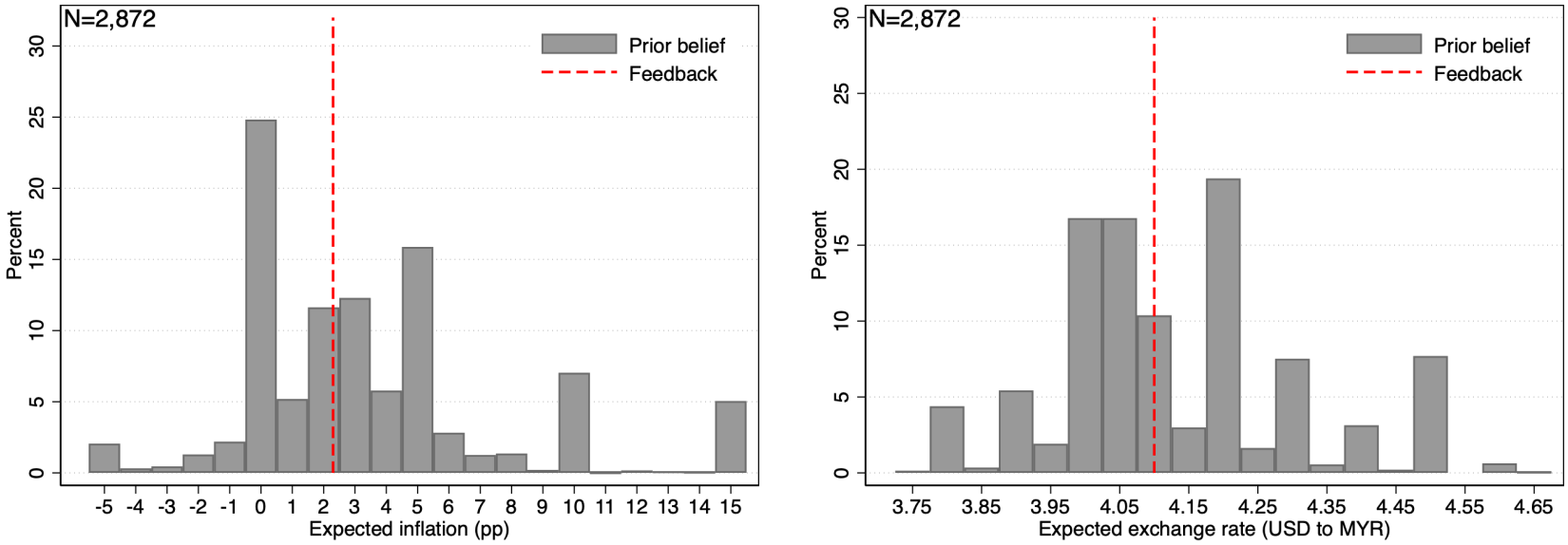


Figure 4: Expenditures by category

Each of the 82 squares in the figure represents $\frac{1}{82}$ 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 Internet Appendix Table IA.1.

Alt Text: Graphical representation of the share of tradables, nontradables, and uncategorized expenditures in the credit card data, identified on the basis of MCCs for each transaction.



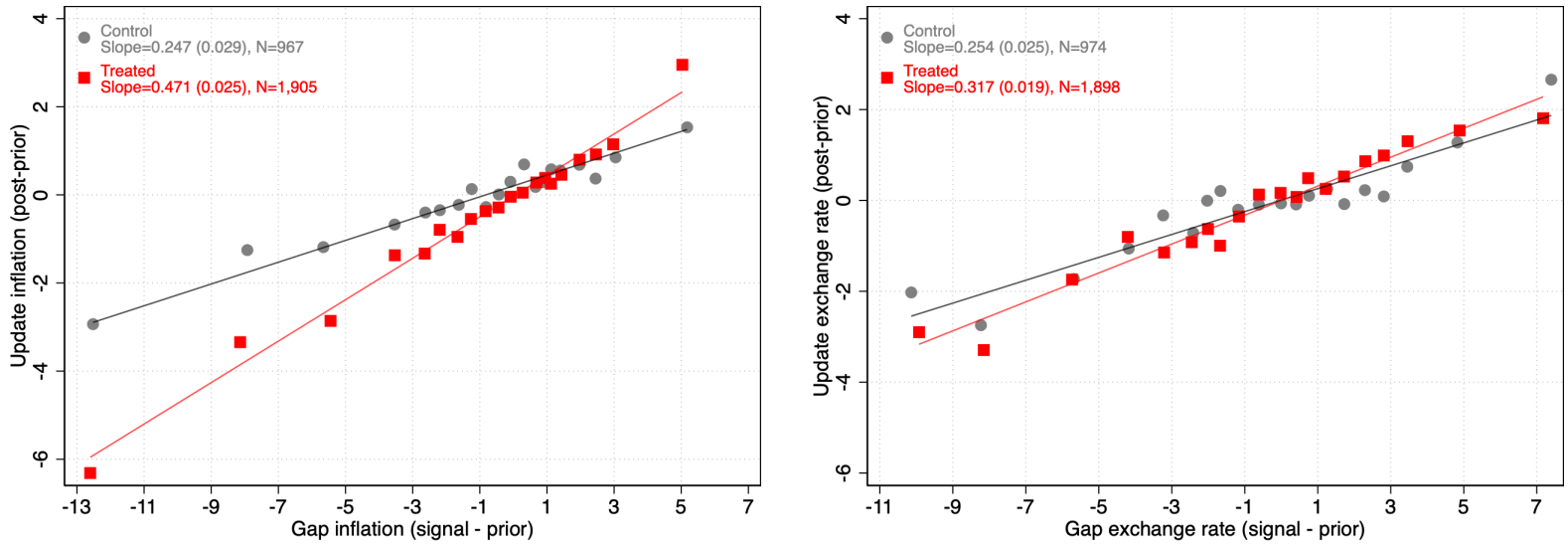
(a) *Inflation priors*

(b) *Exchange rate priors*

Figure 5: Distribution of prior expectations

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$).

Alt Text: Histogram with two panels, showing the distribution of prior beliefs about inflation (panel (a)) and the MYR/US$ exchange rate (panel (b)).



(a) *Inflation expectations*

(b) *Exchange rate expectations*

Figure 6: Belief updating

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 week fixed effects, surveyor fixed effects, and respondent demographics.

Alt Text: Binned scatterplot with two panels showing belief updating for inflation expectations (panel (a)) and exchange rate expectations (panel (b)) in the information experiment. The figure shows that participants in the treatment group, who receive information about the respective variable, update their beliefs toward the signal.

Table 1: Characteristics of participants and nonparticipants

	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	3,087.57	3,128.69	3,049.81	0.113
	(24.97)	(34.28)	(36.09)	
Panel B: monthly expenditures, pre-treatment				
Total	1,069.68	1,095.41	1,046.04	0.264
	(22.28)	(28.07)	(34.09)	
Durables	343.34	364.40	324.00	0.015
	(8.20)	(13.47)	(9.70)	
Tradable durables	259.38	271.97	247.82	0.096
	(7.16)	(11.87)	(8.36)	
Debt balance	1,746.82	1,745.64	1,747.89	0.975
	(36.40)	(46.07)	(55.55)	
Debt repayment	1,113.11	1,139.20	1,089.16	0.444
	(32.80)	(44.96)	(47.48)	
Observations	6,000	2,872	3,128	

The table reports summary statistics on survey respondents and nonrespondents. 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 of 6,000 clients for which the partner bank shared the full set of demographics and transaction data; column (2) reports summary statistics for credit card customers who were contacted and 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 nonrespondents. Robust standard errors of the mean are reported in parentheses.

Table 2: 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	0.356
	(0.01)	(0.01)	(0.01)	(0.01)	
Married	0.54	0.53	0.54	0.52	0.191
	(0.01)	(0.01)	(0.01)	(0.02)	
Number of dependents	0.86	0.82	0.87	0.82	0.090
	(0.02)	(0.03)	(0.03)	(0.04)	
Self-employed	0.10	0.09	0.09	0.09	0.606
	(0.01)	(0.01)	(0.01)	(0.01)	
Monthly average income	3,128.69	3,132.07	3,128.92	3,136.06	0.986
	(34.28)	(42.53)	(41.81)	(60.45)	
Panel B: Monthly expenditures, pre-treatment					
Total	1,128.60	1,135.76	1,122.11	1,129.93	0.935
	(32.97)	(44.16)	(39.64)	(65.89)	
Durables	371.98	387.29	353.48	365.36	0.287
	(16.73)	(24.02)	(12.90)	(20.78)	
Tradable durables	274.09	286.22	259.47	268.89	0.369
	(15.32)	(22.30)	(10.26)	(16.59)	
Debt repayment	1,190.57	1,161.68	1,209.52	1,170.45	0.762
	(48.14)	(44.91)	(65.65)	(66.16)	
Panel C: Prior beliefs					
Prior exchange rate	4.13	4.13	4.13	4.13	0.262
	(0.00)	(0.00)	(0.00)	(0.01)	
Prior inflation	3.39	3.47	3.28	3.32	0.126
	(0.08)	(0.10)	(0.09)	(0.13)	
Observations	2,872	967	974	931	
F-statistic		0.977	1.446	1.017	
p-value		0.465	0.146	0.429	

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. 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 are reported in parentheses.

Table 3: Effects of information on expectations and behavior: Reduced form estimates

	Survey data		Transaction data			
	Δ *Inflation*	Δ *Depreciation*	*Durables*	*Trad. Dur.*	*Debt Repayment*	*Total*
	(1)	(2)	(3)	(4)	(5)	(6)
$\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi}$	0.235***	0.028	1.023	1.667	2.635	–4.402
	(0.037)	(0.026)	(2.823)	(2.060)	(6.294)	(5.569)
$\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d}$	–0.029	0.066**	–3.393	–1.267	–15.909***	–7.537
	(0.023)	(0.031)	(2.601)	(1.907)	(5.800)	(5.191)
Observations	2,872	2,872	2,872	2,872	2,872	2,872
R-squared	0.393	0.227	0.283	0.236	0.512	0.547
Outcome mean	–0.369	–0.212	255.574	176.359	1,029.613	945.995
Outcome median	0.000	0.000	114.550	70.220	668.607	624.003
Outcome st. dev.	2.695	2.837	339.476	250.334	995.531	903.511

The table reports reduced-form effects of the information provision experiment. Each column reports results from a separate OLS regression. Columns (1) and (2) report treatment effects of macroeconomic information on beliefs and correspond to Equations (4) and (5). Columns (3) through (6) report treatment effects on spending and debt repayment and correspond to Equation (6). The term $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ is the gap between the feedback about inflation rate 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. The terms $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ and $T_{i,t}^{d}$ are the corresponding variables for the exchange rate. All regressions control for the gap between the signal and respondents' prior beliefs $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$, respondent gender, age, age squared, number of dependents, household size, education, log income, as well as week and surveyor fixed effects. Regressions in columns (3) to (6) additionally control for pre-treatment spending in each spending category. Δ *Inflation* is the difference between posterior and prior beliefs about the inflation rate $\left(\pi_{i,t}^{post} - \pi_{i,t}^{prior}\right)$. Δ *Depreciation* is the difference between posterior and prior beliefs about the exchange rate $\left(d_{i,t}^{post} - d_{i,t}^{prior}\right)$. *Durables* are average monthly expenditures on durables. *Trad. Dur.* are average monthly expenditures on tradable durables. *Debt Repayment* is average monthly amount of credit card debt repayment. *Total* is average monthly credit card expenditures in all categories. All spending outcomes are measured as averages over 3 months post treatment. Robust standard errors are reported in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 4: Effects of expectations on behavior: Instrumental variables estimates

	Transaction data			
	Durables	*Trad. Dur.*	*Debt Repayment*	*Total*
	(1)	(2)	(3)	(4)
Δ *Inflation*	5.741	7.554	17.751	–15.324
	(11.796)	(8.588)	(26.129)	(23.400)
95% confidence interval	[–16.444, 30.261]	[–8.599, 25.407]	[–31.391, 66.893]	[–63.966, 28.685]
Kleibergen-Paap *F*-statistic	42.561	42.469	42.608	42.616
Δ *Exchange Rate*	–55.536	–22.783	–258.925	–113.051
	(49.733)	(31.793)	(159.115)	(100.784)
95% confidence interval	[..., 28.155]	[..., 55.894]	[..., –85.670]	[..., 36.596]
Kleibergen-Paap *F*-statistic	4.100	4.124	4.025	4.068
Observations	2,872	2,872	2,872	2,872
Outcome mean	255.574	176.359	1,029.613	945.995
Outcome median	114.550	70.220	668.607	624.003
Outcome st. dev.	339.476	250.334	995.531	903.511

The table reports instrumental variables estimates of the effect of expectations on spending and debt repayment. Each column corresponds to a separate instrumental variables regression. The endogenous variables are Δ *Inflation*, which is the difference between posterior and prior beliefs about the inflation rate, and Δ *Exchange Rate*, which is the difference between posterior and prior beliefs about the exchange rate. 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 the gap between the signal and respondents' prior beliefs, $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$, respondent gender, age, age squared, number of dependents, household size, education, log income, as well as week fixed effects, surveyor fixed effects, and pre-treatment spending in each category. *Durables* are average monthly expenditures on durables. *Trad. Dur.* are average monthly expenditures on tradable durables. *Debt Repayment* is the average monthly amount of credit card debt repayment. *Total* is average monthly credit card spending in all categories. All outcomes are measured as averages over 3 months post treatment. Robust standard errors are reported in parentheses; 95% Anderson-Rubin confidence intervals are in brackets. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 5: Effects of expectations on behavior: OLS estimates

	Transaction data			
	Durables	*Trad. Dur.*	*Debt Repayment*	*Total*
	(1)	(2)	(3)	(4)
Δ*Inflation*	–2.253	–1.506	10.023	1.483
	(2.630)	(1.923)	(6.180)	(5.280)
95% confidence interval	[–7.409, 2.904]	[–5.277, 2.265]	[–2.095, 22.140]	[–8.869, 11.835]
Δ*Exchange Rate*	1.260	0.200	–8.461	–1.724
	(2.497)	(1.824)	(4.971)	(4.219)
95% confidence interval	[–3.635, 6.156]	[–3.377, 3.778]	[–18.208, 1.285]	[–9.996, 6.548]
Observations	2,872	2,872	2,872	2,872
R-squared	0.176	0.144	0.512	0.547
Outcome mean	255.574	176.359	1,029.613	945.995
Outcome median	114.550	70.220	668.607	624.003
Outcome st. dev.	339.476	250.334	995.531	903.511

The table reports treatment effects of expectations on spending. Each column corresponds to a separate OLS regression. Δ *Inflation* is the difference between posterior and prior beliefs about inflation. Δ *Exchange Rate* is the difference between the posterior and prior beliefs about the exchange rate. All regressions control for the gap between the signal and prior beliefs, $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$, gender, age, age squared, number of dependents, household size, education, log income, as well as week fixed effects, surveyor fixed effects, and pre-treatment spending in each category. *Durables* are average monthly expenditures on durables. *Trad. Dur.* are average monthly expenditures on tradable durables. *Debt Repayment* is average monthly credit card debt repayment. *Total* is average monthly credit card spending in all categories. All spending outcomes are measured as averages over three months post treatment. Robust standard errors are reported in parentheses; 95% confidence intervals are in brackets. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 6: Effects of information on spending plans: Reduced form estimates

	Survey data					
	Δ *Inflation*	Δ *Depreciation*	*Durables*	*Trad. Dur.*	*Debt Repayment*	*Total*
	(1)	(2)	(3)	(4)	(5)	(6)
$\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right) \cdot T_{i,t}^{\pi}$	0.235***	0.028	–0.001	–0.001	–0.004	–0.007
	(0.037)	(0.026)	(0.007)	(0.007)	(0.008)	(0.006)
$\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right) \cdot T_{i,t}^{d}$	–0.029	0.066**	0.005	0.003	0.007	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	0.227	0.036	0.031	0.069	0.026
Outcome mean	–0.369	–0.212	–0.055	0.005	–0.055	0.088
Outcome median	0.000	0.000	0.000	0.000	0.000	0.000
Outcome st. dev.	2.695	2.837	0.857	0.775	0.857	0.665

The table reports reduced-form treatment effects of the information provision experiment on self-reported spending plans. Each column reports results from a separate OLS regression. Columns (1) and (2) report treatment effects of macroeconomic information on beliefs and correspond to Equations (4) and (5). Columns (3) through (6) report treatment effects on spending and debt repayment and correspond to Equation (6). The term $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ is the gap between the feedback about inflation rate 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. The terms $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$ and $T_{i,t}^{d}$ are the corresponding variables for the exchange rate. All regressions control for the gap between the signal and respondents' prior beliefs $\left(\pi_{i,t}^{signal} - \pi_{i,t}^{prior}\right)$ and $\left(d_{i,t}^{signal} - d_{i,t}^{prior}\right)$, respondent gender, age, age squared, number of dependents, household size, education, log income, as well as week and surveyor fixed effects. Regressions in columns (3) to (6) additionally control for pre-treatment spending in each spending category. Δ *Inflation* is the difference between posterior and prior beliefs about the inflation rate $\left(\pi_{i,t}^{post} - \pi_{i,t}^{prior}\right)$. Δ *Depreciation* is the difference between posterior and prior beliefs about the exchange rate $\left(d_{i,t}^{post} - d_{i,t}^{prior}\right)$. *Durables* are average monthly expenditures on durables. *Trad. Dur.* are average monthly expenditures on tradable durables. *Debt Repayment* is average monthly credit card debt repayment. *Total* is average monthly credit card expenditures in all categories. All spending outcomes are measured as averages over 3 months post treatment. Robust standard errors are reported in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 7: Survey experiment: Effects of hypothetical shocks on spending plans

Scenario:	Inflation				Depreciation			
	Durables	*Trad.Dur.*	*DebtRep.*	*Total*	*Durables*	*Trad.Dur.*	*DebtRep.*	*Total*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Baseline								
$\Delta Belief$	−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	2,302	2,302	2,302	2,302	2,302	2,302	2,302	2,302
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 median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Outcome st. dev.	0.743	0.775	0.745	0.742	0.757	0.752	0.748	0.784
Panel B: By financial literacy								
$\Delta Belief$	−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)
$\Delta Belief \cdot FinLit_i$	−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	1,910	1,910	1,910	1,910	1,910	1,910	1,910	1,910
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 median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Outcome st. dev.	0.743	0.775	0.745	0.742	0.757	0.752	0.748	0.784

The table reports reduced form treatment effects from the mental model survey experiment. Each column corresponds to a separate OLS regression. Panel A shows the effect of increases in expected inflation and depreciation rates in a hypothetical scenario relative to respondent prior beliefs. Panel B shows heterogeneous treatment effects for respondents with high (above median) and low (below median) financial literacy. Columns (1) through (4) report results for hypothetical inflation shocks and columns (5) through (8) report results for hypothetical exchange rate depreciation shocks. For the inflation scenario, $\Delta\ Belief_i = \left(\pi_i^{scenario} - \pi_i^{prior}\right)$ is the gap between the hypothetical inflation rate shown to the respondent and the respondent's prior belief. For the depreciation scenario, $\Delta\ Belief_i = \left(d_i^{scenario} - d_i^{prior}\right)$ is the analogous gap for the depreciation rate. $FinLit_i$ is an indicator variable that takes the value 1 for respondents with an above-median financial literacy score. Each regression controls for the corresponding hypothetical baseline scenario. Panel B additionally controls for the financial literacy indicator $FinLit_i$ and its interaction with the hypothetical baseline scenario. *Durables* is planned spending on durables; *Trad. Dur.* is planned spending on electronics, the most common type of tradable durable goods in the data; *Debt Rep.* is the planned amount of monthly credit card debt repayment; and *Total* is planned total spending. Robust standard errors are reported in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

Table 8: Survey experiment: Effects of hypothetical shocks on demand for inflation indexed security

Scenario:	Inflation		Depreciation	
	Demand for inflation indexed asset			
	(1)	(2)	(3)	(4)
$\Delta Belief$	0.015***	−0.010	0.020***	0.000
	(0.004)	(0.009)	(0.004)	(0.009)
$\Delta Belief \cdot FinLit_i$		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 median	−1.000	0.000	−1.000	0.000
Outcome st. dev.	0.914	0.927	0.908	0.912

The table reports reduced form treatment effects on demand for inflation indexed securities in the mental model survey experiment. Each column corresponds to a separate OLS regression. Columns (1) and (2) report results for hypothetical inflation shocks and columns (3) and (4) report results for hypothetical exchange rate depreciation shocks. For the inflation scenario, $\Delta Belief_i = \left(\pi_i^{scenario} - \pi_i^{prior}\right)$ is the gap between the hypothetical inflation rate shown to the respondent and the respondent's prior belief. For the depreciation scenario, $\Delta Belief_i = \left(d_i^{scenario} - d_i^{prior}\right)$ is the analogous gap for the depreciation rate. $FinLit_i$ is an indicator variable that takes the value 1 for respondents with an above-median financial literacy score The dependent variable in all regressions is an indicator equal to 1 if the respondent states that they would like to purchase the inflation indexed asset. All regressions additionally control for the financial literacy indicator $FinLit_i$ and the hypothetical baseline scenario. Robust standard errors are reported in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.