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Abstract

The Lucas critique holds that policy evaluations based on historical correlations can fail because policy changes alter expectation formation. We develop a new approach to monetary policy evaluation that addresses this concern: we elicit expectations under alternative policy scenarios from household surveys and feed these measured expectations into a heterogeneous agent model. The surveys reveal that the response of income and inflation expectations to interest rate changes is state-dependent. Incorporating these expectation differences into the model yields estimates of the effects of policy on aggregate consumption that are state-dependent, varying with economic conditions at the time of the policy change.

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1 Introduction

The Lucas critique implies that policy evaluations based on historical correlations can fail because policy changes alter how agents form expectations (Lucas, 1976). One way to overcome this critique involves modeling how expectations are formed in response to policy shocks. That is difficult because policy announcements can move expectations through multiple channels, sometimes in opposite directions. In the case of monetary policy, for instance, conventional effects and signaling effects can work against each other, and their time-varying relative importance may generate substantial state dependence in how policy announcements affect expectations (Coibion and Gorodnichenko, 2012).

In this paper, we take a different approach. We combine a standard heterogeneous-agent model with survey-measured expectations under alternative policy scenarios. We apply this approach to monetary policy announcements. Using tailored surveys, we measure how households' expectations differ across policy scenarios and feed those expectation differences into a heterogeneous-agent model. This allows us to avoid imposing a specific model of expectation formation.[1]

The main idea of this paper can be illustrated with a simple example. Many macroeconomic models imply equations of the form:

$$Y = \alpha E\left[X\left(Z\right)\right], \tag{1}$$

where Y is an outcome variable (e.g., consumption of an individual), X is an endogenous variable (e.g., lifetime income of the individual), and Z is a structural shock (e.g., a policy shock). Furthermore, α is a coefficient and E is the subjective expectation of the agent. The marginal effect of the structural shock on the outcome variable is

$$\frac{\partial Y}{\partial Z} = \alpha \frac{\partial E\left[X\left(Z\right)\right]}{\partial Z}.$$

To compute the derivative $\frac{\partial E[X(Z)]}{\partial Z}$, one usually makes assumptions about expectation formation. The most common assumption is that agents have full-information rational expectations: agents know the realization of the shock Z and are right about how the distribution of X moves with Z (Christiano et al., 2005; Eggertsson and Woodford, 2003; Kaplan et al., 2018). One alternative is to assume that agents have incomplete information about the realization of Z, e.g., due to sticky information (Mankiw and Reis, 2002), exogenous noisy signals (Angeletos and La'O, 2009; Woodford, 2003),

[1] In a recent commentary, Monika Piazzesi calls for the use of subjective beliefs measured in surveys as an input in theoretical models (Brunnermeier et al., 2021). For an introduction to this "temporary equilibrium with measured expectations" approach see Piazzesi and Schneider (2016). Applications include Landvoigt et al. (2015) and Leombroni et al. (2020).

or rational inattention (Mackowiak and Wiederholt, 2009; Sims, 2003). The other alternative is to assume that agents have distorted beliefs about the effect of Z on X, e.g., due to adaptive learning (Evans and Honkapohja, 2012), level-k thinking (Farhi and Werning, 2019), or diagnostic expectations (Bordalo et al., 2019).

We take a different route here. Rather than imposing a model of expectation formation, we directly elicit the expectation $E[X(Z)]$ for alternative policies from household surveys. This allows us to compute the effect of the shock Z on the outcome variable Y under weak assumptions about expectation formation.

Model. We implement this idea in the context of a Heterogeneous Agent New Keynesian model. Specifically, we compute the response coefficients—or Jacobians—of the household block from the canonical HANK model in Auclert et al. (2025). These Jacobians summarize how aggregate consumption today responds to changes in expected real interest rates and expected income at each future date. The expected paths that enter these Jacobians are taken directly from survey data rather than from an equilibrium solution. Because our survey provides individual-level expectations, and households differ in their marginal propensities to consume, we can also account for the covariance between individual Jacobians and individual expectation responses—a channel that matters when, for example, high-MPC households form systematically different expectations than low-MPC households.

Measured expectations. In our surveys, conducted with representative samples of US households, we present respondents with a baseline scenario and an alternative scenario featuring a different monetary policy decision, and we elicit their expectations about the federal funds rate, the inflation rate, and their nominal household income under each scenario using hypothetical vignettes. The expectations in the alternative and the baseline scenario provide the expected paths for each policy scenario that enter the consumption equation.

Setting. We apply this approach to study the effects of monetary policy at four points before, during, and after the post-pandemic US inflation surge, eliciting expectations under two policies that differ in the current or projected interest rate. In March 2021, we study unconventional monetary policy, with broad agreement at the Fed to keep rates near zero, by varying the projected future federal funds rate. In March 2022, we examine a rate increase amid debate over the timing and size of an initial hike. In September 2022, we study a larger rate increase in an environment of elevated inflation after the Fed Chair had emphasized the potential costs of disinflation. In September 2025, we study a rate cut during uncertainty about its magnitude. In each case, elicitation took place in the days before FOMC meetings to capture expectations in the relevant context.

State-dependent expectation responses. Our surveys reveal strong state dependence in expectation responses. In March 2021, inflation expectations are lower under the higher projected federal funds rate than under the baseline, consistent with textbook logic. By contrast, in March and September 2022, households report higher inflation expectations in the rate-hike scenario than in the no-change scenario, consistent with a signaling interpretation in which tighter policy conveys worse news about inflationary pressures. In September 2025, by contrast, inflation expectations are modestly *lower* at longer horizons in the rate cut scenario than in the no-change scenario. Income expectations also vary across settings: cumulative expected income growth is significantly lower in the tightening scenario in March 2021 and September 2022, with the latter showing a particularly strong response after the Fed had emphasized the potential pain of disinflation, while income expectations differ less across scenarios in March 2022 and September 2025. These patterns highlight why it is useful to measure expectation responses episode by episode rather than imposing a single model of expectation formation.

Model-based consumption responses. To compute the model-based aggregate consumption responses, we feed the estimated expectation counterfactuals into a heterogeneous-agent consumption model using the Sequence-Space Jacobian framework of Auclert et al. (2021). A central finding across all four episodes is that the income channel dominates the consumption response, consistent with the importance of indirect effects of monetary policy emphasized by Kaplan et al. (2018).

The estimated impact responses vary substantially across episodes. Forward guidance in March 2021 produces a *positive* response of $+0.27$ percent: lower inflation expectations under tightening raise expected real income, more than offsetting the intertemporal substitution effect. The March 2022 rate hike produces a -0.56 percent response, driven entirely by the income channel—inflation expectations are higher in the rate-hike scenario than in the no-change scenario, consistent with a signaling interpretation in which the rate increase conveys the Fed's private information about future inflationary pressures, eroding expected real income. September 2022, with a more aggressive tightening scenario, implies a -0.96 percent response, reflecting both stronger inflation expectation responses and significant reductions in nominal income expectations after the Fed had emphasized the potential costs of disinflation. September 2025 yields a near-zero $+0.08$ percent.

Strikingly, the March 2021 and March 2022 scenarios both feature a 40 basis point tightening, but differ in timing, policy instrument, and macroeconomic environment. The two scenarios produce consumption responses of opposite sign. While we cannot separately identify the role of the policy instrument from the surrounding macroeconomic environment, the results show that measured expectation responses

differ sharply across episodes and are central for the sign of the implied consumption response. In both cases, the income channel accounts for the bulk of the response.

Exploiting the individual-level variation in our data, we show that the covariance between household-level Jacobians and individual expectations is quantitatively important. Households with high intertemporal MPCs, those with low wealth and tight borrowing constraints, tend to expect larger income declines in the rate hike scenario. For the September 2022 experiment, accounting for this covariance amplifies the aggregate consumption decline by about 56 percent relative to what average expectations alone would imply. This finding underscores the value of individual-level expectation data: using only average expectations and average Jacobians would substantially understate the aggregate consumption response.

Extensions. We pursue three extensions. First, we explore consumption dynamics beyond the impact period by introducing a simple constant-gain learning rule in which agents gradually revise their beliefs toward realized equilibrium outcomes. Learning dampens the consumption responses: in the rate-hike episodes, the equilibrium contraction is less severe than what the surveys imply, so updating generates positive surprises that make the trough shallower and the recovery faster. The initial survey expectations are key for the entire consumption trajectory: scaling expectations by a common factor shifts the implied consumption path proportionally and persistently, with no convergence over the horizons we consider. This sensitivity provides further motivation for disciplining expectations with survey data.

Second, to validate our approach, our September 2022 survey additionally elicits differences in respondents' consumption plans across the two hypothetical scenarios, using a simple qualitative format asking under which scenario the household would make fewer non-durable purchases. At the aggregate level, the model-based estimates are qualitatively aligned with the self-reported responses. At the individual level, households for whom the model predicts a larger consumption decline are significantly more likely to report fewer purchases under the rate hike, and this relationship holds both for total consumption and for each of its constituent channels.

Third, we incorporate an additional transmission channel of monetary policy: the *valuation channel*. Changes in expected real interest rates affect the present value of long-lived assets such as housing, and the resulting wealth changes feed back into household consumption (Auclert et al., 2025). In a standard model, a contractionary policy lowers asset prices and dampens consumption. Survey-measured home price expectations for the March 2021 announcement, however, tell a different story: households on average expect home prices to *rise* more in the rate-hike scenario, which turns the valuation effect positive. As a result, the sign of the valuation channel depends critically on whether we use home prices implied by the model or survey expectations.

Related literature. We contribute to a literature assessing the effects of monetary policy in heterogeneous agent models. A key insight from this literature, emphasized by Auclert (2019); Kaplan et al. (2018); Luetticke (2021), is that the income channel of monetary policy can dominate intertemporal substitution. Our results corroborate this finding with measured expectations rather than model-implied equilibrium paths. A growing literature departs from full-information rational expectations by specifying a particular mechanism for expectation formation: information frictions (Auclert et al., 2024), incomplete common knowledge (Angeletos and Lian, 2018), ambiguity-averse preferences (Ilut et al., 2025), or behavioral frictions (Gabaix, 2020). Our core methodological contribution is to derive from the model which expectations are relevant for the policy counterfactual and to measure those expectations with a survey, replacing assumptions about how expectations are formed. Our survey data show that this matters in practice: the way expectations respond to policy varies across economic environments, which would require re-specifying the friction in any model-based approach.

Our approach builds on the "temporary equilibrium with measured expectations" program in macro-finance, which treats survey beliefs as direct inputs into equilibrium models (Brunnermeier et al., 2021; Piazzesi and Schneider, 2016). We extend this idea from asset-pricing and housing applications to the evaluation of monetary policy in a HANK economy. We design policy-scenario surveys to elicit the full counterfactual expectation paths that are sufficient for the consumption block: expected nominal rates, inflation, and household income under alternative policy announcements.[2] Sequence-space methods make this approach operational, because the relevant model objects are precisely Jacobians mapping anticipated paths of prices and incomes into consumption. We therefore combine the discipline of a structural HANK model with directly measured policy counterfactuals, and, using individual-level expectations and individual-level Jacobians, we allow the aggregate response to depend on the covariance between households' beliefs and their marginal propensities to consume.

This approach has several desirable features. It is ex-ante, allowing policymakers to compare policy options before committee meetings; it captures state dependence by conditioning on current expectation counterfactuals and attention; it can be tailored to new policy measures for which no historical data exist; and by eliciting expectation differences at the individual level, it lets researchers vary other model inputs, such as the fraction of the population paying attention to the announcement.

We also contribute to a literature that empirically studies households' expectation

[2]Other examples that use surveys to inform models typically focus on particular partial-equilibrium responses: Bachmann et al. (2021) study the German VAT cut using survey and scanner data together with a HANK model; Fuster et al. (2021) and Colarieti et al. (2024) use hypothetical income-shock vignettes to discipline consumption responses; and Coibion et al. (2024) use randomized information treatments to study the effect of macroeconomic uncertainty on spending.

formation in the context of monetary policy (Andre et al., 2022, 2026; Coibion et al., 2020b; D'Acunto et al., 2021; Link et al., 2023). For instance, Coibion et al. (2022) and Coibion et al. (2020a) conduct information provision experiments to study how households' inflation expectations respond to communication about future inflation or policy rates. Complementary to our paper, Grigoli et al. (2026) combine measurement of households' beliefs about the effects of monetary policy through hypothetical scenarios with estimates of the elasticity of spending to inflation expectations from information interventions. Our paper differs from these studies in at least two ways: We advance this literature by feeding measured expectation differences directly into a heterogeneous-agent consumption model after having derived which expectations matter for the policy counterfactual. Second, because our approach conditions on expectations measured at the time of a specific policy decision, it naturally captures state dependence in how policy affects the economy.

2 Theoretical framework

This section presents a model of consumption differences across policy announcements on interest rates. In Section 4, we use this model together with our experimentally estimated expectation differences across policy scenarios to study the effects of conventional and unconventional monetary policy.

2.1 Lucas (1976)

Lucas (1976) pointed out that one should take into account how expectations vary across alternative policies and started the sequence of examples in his Section 5 with a consumption example. Here we present a strongly simplified version of that example. Suppose that the consumption of an individual i is given by the permanent income hypothesis: $c_{it} = (1-\beta)E_{it}[\sum_{s=t}^{\infty}\beta^{s-t}y_{is}]$. Assume that the income of the individual follows a random walk, which implies $E_{it}[y_{is}] = y_{it}$ for all $s \geq t$. An econometrician observing consumption and income would conclude that consumption equals income, $c_{it} = y_{it}$. Next, consider a policy taking the form of a constant increase in income over the entire future from time T on. The policy is announced at time $\tau < T$. One would like to forecast the effect of the policy. Forecasting the effect of the policy based on the past relationship between consumption and income, here $c_{it} = y_{it}$, does not take into account the effect of the adjustment of the expectation in $c_{it} = (1-\beta)E_{it}[\sum_{s=t}^{\infty}\beta^{s-t}y_{is}]$ upon announcement of the policy. However, predicting the effect of the policy assuming that consumers accurately recalculate the present value of their lifetime income upon hearing the announcement may also not be correct, especially if a policy is announced

that might not be implemented in the end. In essence, Lucas (1976) is saying in his Section 5 that for policy evaluation it is important to take into account correctly how expectations vary across policies.

We develop a new approach for addressing Lucas' (1976) point. The theory of consumption that we use to forecast the effects of policy on aggregate consumption is taken from a canonical HANK model. To measure how expectations vary with policies, we field a survey before policy meetings containing hypothetical policy scenarios.

2.2 The consumption block of a canonical HANK model

The theory of consumption that we will use to forecast the effects of monetary policy on aggregate consumption is taken from a canonical HANK model, because HANK models are emerging as leading frameworks to study the impact of monetary and fiscal policy on the macroeconomy. We will use the theory of consumption from the HANK model in Auclert et al. (2025), but one could also use the theory of consumption from a different HANK model.

The economy is populated by a mass 1 of agents. Households can save in a single liquid asset, subject to a borrowing constraint, and earn labor income, which is taxed at rate τ_t. Households have preferences over consumption c_{it} and hours worked n_{it}, with a utility function that is additively separable in these two arguments. The problem of household i, starting at time $t = 0$ with asset position $a_{i,-1}$, idiosyncratic income state e_{i0} and discount factor β_{i0}, is given by

$$\max_{c_{it},n_{it}} E_{i0}\left[\sum_{t=0}^{\infty}\left(\prod_{s\leq t-1}\beta_{is}\right)\left(\frac{c_{it}^{1-\gamma}}{1-\gamma}-v\left(n_{it}\right)\right)\right], \tag{2}$$

subject to the sequence of flow budget constraints

$$P_t c_{it} + a_{it} = (1 + i_{t-1})a_{it-1} + (1 - \tau_t)w_t e_{it} n_{it} + d_{it}, \tag{3}$$

and the sequence of borrowing limits

$$a_{it} \geq 0. \tag{4}$$

In the objective, the product $\left(\prod_{s\leq t-1}\beta_{is}\right)$ is the discounting of utility in period t with $\beta_{is} \in (0,1)$, the parameter $\gamma > 0$ is the inverse of the intertemporal elasticity of substitution, and the function $v : \mathbb{R}_+ \to \mathbb{R}$ is the disutility of labor function, which is twice continuously differentiable, strictly increasing, and convex. In equation (3), P_t is the price level in period t, a_{it} are the household's nominal asset holdings between periods t and $t+1$, i_{t-1} is the net nominal interest rate on asset holdings between

periods $t-1$ and t, w_t is the pre-tax nominal wage rate per unit of efficient labor, and d_{it} denotes nominal lump-sum net transfers that the household is receiving in period t.[3]

The main idea of the paper is to measure how key expectations vary with policy. The expectation operator E_{i0} is the expectation operator of individual i in period zero. The common practice is to make assumptions about expectation formation (e.g., perfect foresight, full-information rational expectations (FIRE), or some deviation from FIRE) in order to compute model-implied predictions about how expectations vary with policy. We instead treat expectations conditional on policy as objects that can be measured.

2.3 The main idea of the paper illustrated with a simple example

In this subsection, we illustrate the main idea of the paper with a simple example. Assume that, for some household i in the economy, the borrowing constraint (4) is currently not binding and the household assigns zero probability to this constraint being binding in the future. Put differently, consider a household who is currently not borrowing constrained and does not believe to be borrowing constrained in the future. Under very weak assumptions about knowledge and beliefs of the household, a log-linear approximation of the present value budget constraint and a log-linear approximation of the consumption Euler equation for different horizons yield the consumption function:

$$
\begin{aligned}
\hat{c}_{it} = \; & \frac{\frac{1}{\frac{c_i}{\tilde{y}_i}}(1-\beta)\, E_{it}\left[\sum_{s=t}^{\infty}\beta^{s-t}\hat{y}_{is}\right]}{} \\
& +\left(\frac{1}{\frac{c_i}{\tilde{y}_i}}(1-\beta)\,\frac{1}{\beta}\frac{\tilde{a}_i}{\tilde{y}_i}-\frac{1}{\gamma}\right)\beta E_{it}\left[\sum_{s=t}^{\infty}\beta^{s-t}\left(i_s-\pi_{s+1}\right)\right] \\
& +\frac{1}{\frac{c_i}{\tilde{y}_i}}(1-\beta)\,\frac{1}{\beta}\frac{\tilde{a}_i}{\tilde{y}_i}E_{it}\left[\left(i_{t-1}-\pi_t\right)+\hat{a}_{it-1}\right].
\end{aligned}
\tag{5}
$$

Here $\hat{c}_{it} = \ln(c_{it}) - \ln(c_i)$ denotes the log-difference between the consumption of the household in period t and the consumption of the household in the point around which the log-linearization is performed. The consumption of household i in period t depends on the expected present value of lifetime, real, non-interest income, on the expected path of the real interest rate, because of an interest income effect with a positive sign and an intertemporal substitution effect with a negative sign, and on the perceived beginning-of-period real liquid wealth.

Next, let us turn to the effect of implementing one policy announcement rather than another policy announcement on consumption in period t. Let $\Delta\hat{c}_{it} = \hat{c}_{it}^{PolicyA} -$

[3]There is a small difference in notation to Auclert et al. (2025). They denote by a_{it} and w_t real asset holdings and the real wage rate, while we denote by a_{it} and w_t nominal asset holdings and the nominal wage rate. Auclert et al. (2025) assume that hours worked, n_{it}, are set by unions according to current labor demand. This model specification is nested as a special case by adding the constraint that n_{it} has to be equal to the value set by unions.

$\hat{c}_{it}^{PolicyB}$ denote the difference between consumption of the household in period t under policy announcement A and consumption of the household in period t under policy announcement B. Let $\Delta E_{it}[X] = E_{it}^{PolicyA}[X] - E_{it}^{PolicyB}[X]$ denote the difference between the household's expectation of variable X under policy announcement A and the household's expectation of the same variable under policy announcement B. Equation (5) implies that[4]

$$\Delta\hat{c}_{it} = \underbrace{\frac{1}{\frac{c_i}{\tilde{y}_i}}(1-\beta)\quad \Delta E_{it}\left[\sum_{s=t}^{\infty}\beta^{s-t}\hat{y}_{is}\right]}_{\text{difference in expected non-interest income path}} + \left(\frac{1}{\frac{c_i}{\tilde{y}_i}}(1-\beta)\frac{1}{\beta}\frac{\tilde{a}_i}{\tilde{y}_i} - \frac{1}{\gamma}\right)\beta \underbrace{\Delta E_{it}\left[\sum_{s=t}^{\infty}\beta^{s-t}(i_s - \pi_{s+1})\right]}_{\text{difference in expected interest rate path}} . \tag{6}$$

The left-hand side of equation (6) is the log-difference between consumption of household i in period t under policy announcement A and consumption of the same household in the same period under policy announcement B. This difference in consumption is determined by the difference in expectations across the two policy announcements. The key idea of this paper is to address Lucas' (1976) point by eliciting the differences in expectations that appear in equation (6) with a survey. The common practice is instead to assume full information about the present and perfect foresight about future aggregate variables to take the aggregate variables in equation (5) outside of the expectation operator and to specify a model of the interest rate, inflation, and income to compute these present value terms. In the next section we illustrate our approach using a canonical HANK model.

2.4 The main idea of the paper implemented in a HANK model

Consider a household deciding how much to consume today. This decision depends on current income, expected future income, current and expected interest rates, and current wealth. In a heterogeneous agent economy, households also face borrowing constraints and idiosyncratic income risk, which shape their marginal propensity to consume.

We summarize aggregate household behavior through response coefficients that answer a simple question: if households expect a change in one input—say, the interest rate in some future period—by how much does aggregate consumption today change? Formally, let dC_0 denote the change in aggregate consumption at $t = 0$. We can write

[4]The term $\Delta E_{it}[(i_{t-1} - \pi_t) + \hat{a}_{it-1}]$ equals zero if the content of the policy announcement does not affect the perceived beginning-of-period real liquid wealth, which we assume here.

this as:

$$dC_0 = \sum_{s=0}^{T-1} \mathcal{M}_s^r \cdot dr_s + \sum_{s=0}^{T-1} \mathcal{M}_s^Y \cdot dY_s \tag{7}$$

The coefficient $\mathcal{M}_s^r$ measures how consumption today responds to a change in the expected real interest rate at date s. The coefficient $\mathcal{M}_s^Y$—the *intertemporal marginal propensity to consume*—measures the response to expected income at date s. Following Auclert et al. (2021), we call these coefficients the *Jacobians* of the household block.

Model. We compute the Jacobians from the Heterogeneous Agent New Keynesian model described in Auclert et al. (2025). Households have CRRA preferences, face uninsurable idiosyncratic income risk, and are subject to a borrowing constraint. They choose consumption and savings in a single liquid asset to maximize expected lifetime utility. The calibration matches standard targets: an average marginal propensity to consume of approximately 0.15 and a wealth distribution consistent with U.S. data.

The Jacobians encode key features of household behavior. A higher interest rate affects consumption through multiple effects, so $\mathcal{M}_s^r$ may be negative or positive. Higher expected future income raises consumption today, but by less than current income, so $\mathcal{M}_s^Y$ is positive but declines with the horizon s. Because households are heterogeneous in wealth and income risk, the aggregate Jacobians reflect a distribution of individual responses: borrowing-constrained households have high MPCs; wealthy households have low MPCs.

Expectations from survey data. The key innovation is where the expected paths $\{dr_s\}$ and $\{dY_s\}$ come from. In a standard model, one would solve for equilibrium paths under an assumption about expectation formation—typically rational expectations. We take a different route: we measure expectations directly from household surveys.

Our survey elicits household expectations for the federal funds rate, inflation, and their own income at various horizons. Crucially, we elicit these expectations under two scenarios: a baseline policy and an alternative policy. The *difference* in expectations across scenarios gives us the paths $\{dr_s^{survey}\}$ and $\{dY_s^{survey}\}$ that enter equation (7).

This approach has a key advantage: we remain agnostic about the mechanism generating expectations. Households may incorporate news that they hear about to a limited extent into beliefs due to inattention, use simple heuristics, or form expectations through social learning—we do not need to specify which. We simply observe what they expect. Whatever information frictions or bounded rationality shape their beliefs, the measured expectations capture the relevant input for consumption decisions.

The Period Zero Outcome. The survey provides expectations for future periods ($s \geq 1$). For the current period ($s = 0$), we must solve for equilibrium values implied by

these future expectations.

Separating equation (7):

$$dC_0 = \underbrace{\mathcal{M}_0^r \cdot dr_0 + \mathcal{M}_0^Y \cdot dY_0}_{\text{Current period}} + \underbrace{\sum_{s=1}^{T-1} \left(\mathcal{M}_s^r \cdot dr_s^{survey} + \mathcal{M}_s^Y \cdot dY_s^{survey} \right)}_{Z_0} \tag{8}$$

The term Z_0 captures how expectations about the future—measured in the survey—affect current consumption. This is computed directly from the data and the model Jacobians.

For the current period, the real interest rate is pinned down by the policy announcement and expected inflation:

$$dr_0 = di_0 - d\pi_1^{survey} \tag{9}$$

where di_0 is the announced change in the nominal rate and $d\pi_1^{survey}$ is expected inflation from the survey. Current output is determined by goods market clearing, $dC_0 = dY_0$, which yields:

$$dY_0 = \frac{\mathcal{M}_0^r \cdot dr_0 + Z_0}{1 - \mathcal{M}_0^Y} \tag{10}$$

The denominator reflects the Keynesian multiplier: higher income raises consumption, which raises income further.

2.5 Heterogeneity in expectations

The previous subsection presented aggregate consumption as a function of average expected paths. Yet, not all households respond to policy announcements in the same way. Some may be more attentive to monetary policy news; others may hold different mental models of how interest rates affect the economy. Our survey captures this variation: we observe how each respondent's expectations differ across the baseline and alternative scenarios. When expectations vary across households, and households also differ in their marginal propensities to consume, aggregating requires care.

From aggregate to household-level. The aggregate consumption equation (7) implicitly assumes all households share the same expectations. To allow for heterogeneous expectations, we return to the underlying household problem. Let i index households. Household i's consumption response depends on her individual

expectations:

$$dc_{i0} = \sum_{s=0}^{T-1} m^r_{s,i} \cdot dr_{s,i} + \sum_{s=0}^{T-1} m^Y_{s,i} \cdot dY_{s,i} \tag{11}$$

where $dr_{s,i}$ and $dY_{s,i}$ are household i's expectations for real interest rates and income at date s, and $m^r_{s,i}$ and $m^Y_{s,i}$ are household i's individual Jacobians—her marginal responses to expected interest rates and income.

Aggregate consumption is the integral over households:

$$dC_0 = \int dc_{i0}\, d\mu(i) = \int \left[\sum_{s=0}^{T-1} m^r_{s,i} \cdot dr_{s,i} + \sum_{s=0}^{T-1} m^Y_{s,i} \cdot dY_{s,i} \right] d\mu(i) \tag{12}$$

This expression differs from equation (7) when expectations and Jacobians are correlated across households. If high-MPC households (e.g., borrowing-constrained households) systematically form different expectations than low-MPC households, then the aggregate response depends on this covariance.

Decomposition. To see this clearly, consider the income channel. We can decompose the aggregate response to expected income into:

$$\int \sum_s m^Y_{s,i} \cdot dY_{s,i}\, d\mu(i) = \sum_s \bar{\mathcal{M}}^Y_s \cdot \overline{dY}_s + \sum_s \text{Cov}\left(m^Y_{s,i}, dY_{s,i}\right) \tag{13}$$

where $\bar{\mathcal{M}}^Y_s = \int m^Y_{s,i}\, d\mu(i)$ is the average intertemporal MPC and $\overline{dY}_s = \int dY_{s,i}\, d\mu(i)$ is the average expected income change. The first term is what we would compute using average expectations and average Jacobians—this is equation (7). The second term captures the covariance between individual MPCs and individual expectations.

This covariance term is positive if households with high MPCs expect larger income changes, and negative if they expect smaller changes. In Section 4.3 we quantify this term and find that it amplifies the aggregate consumption decline in our September 2022 experiment by about 56 percent relative to what average expectations alone would imply: liquidity-constrained households (who have high MPCs) are also more pessimistic about future income following a rate hike.

3 Survey: Measured expectations

In this section we describe how we elicit expectations under different policy counterfactuals in surveys and apply our approach in four different settings. The full instructions for all our surveys can be found in Appendix G.

3.1 Design

Our surveys—conducted briefly before meetings of the Fed—rely on hypothetical scenarios in which respondents are presented with two alternative monetary policy decisions. To ensure a common-ground definition, we first briefly introduce respondents to the federal funds rate. Respondents are then presented with a baseline scenario. For instance, in one of our surveys, this scenario reads as follows:

> Please imagine that at the next meeting of the Fed on March 15/16 2022, the Fed decides to keep the current federal funds rate **unchanged at 0.1 percent**.
>
> Note: further imagine that the Fed's projection for the federal funds rate at the end of 2031 remains **unchanged** at 2.5 percent.

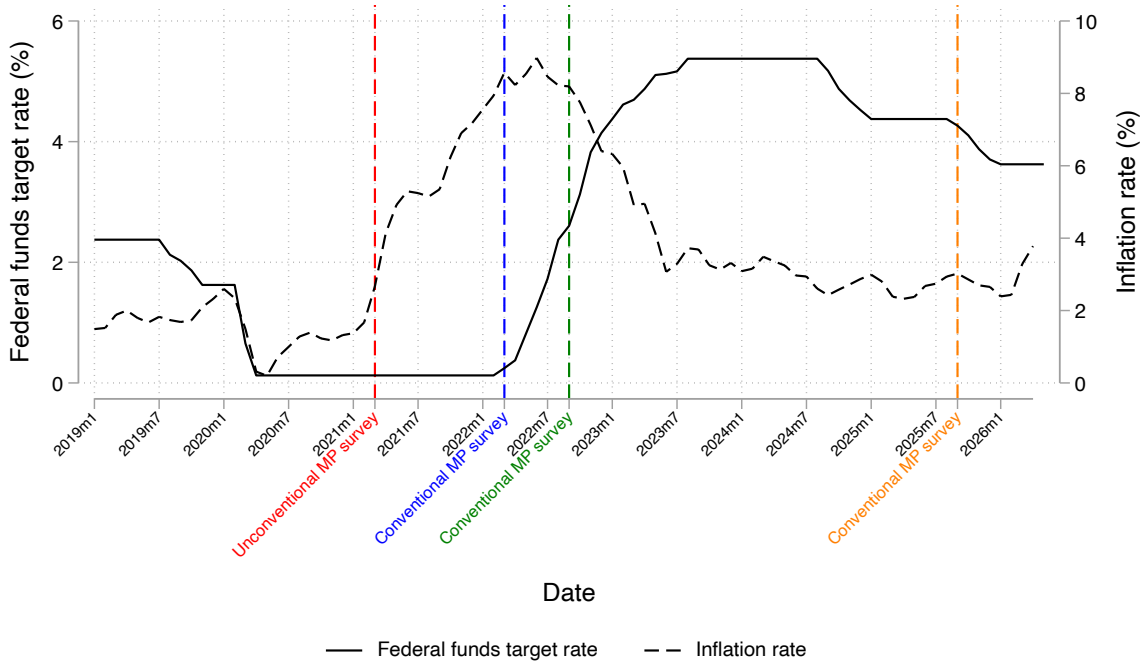
We subsequently ask the respondents to imagine that they heard about the Fed announcement, and elicit their expectations under this hypothetical scenario about different variables: the federal funds rate at the end of the current calendar year (in the example above: 2022) and at various points in the future until the end of the calendar year nine years from the current one; annual inflation and annual household income in the current and the following calendar years until five years in the future, asking for averages over multiple years for later years within that period. To make it clear to respondents that we are interested in their expectations conditional on attention to the policy change, we explicitly ask them about their expectations "if they learned about the Fed's announcement". Respondents then proceed to an alternative scenario. For instance, in the survey from which the baseline scenario above is taken, the alternative scenario reads as follows:

> We will now ask you to consider the following alternative hypothetical scenario.
>
> Please imagine that at the next meeting of the Fed on March 15/16 2022, the Fed **increases** the current federal funds rate **from 0.1 to 0.5 percent**.
>
> Note: further imagine that the Fed's projection for the federal funds rate at the end of 2031 remains **unchanged** at 2.5 percent.

We then re-elicit respondents' expectations about the federal funds rate, the inflation rate, and their net household income over different time horizons under this alternative scenario. The differences in expectations between alternative and baseline scenario can be interpreted as the perceived effects of the alternative policy on future economic outcomes in the eyes of a given respondent. We also elicit several background characteristics. Among others, we measure households' typical attention to Fed announcements, which we use in some of our exercises. Appendix D.2 provides details.

Several aspects of this experimental design are noteworthy. First and most importantly, the baseline and the alternative scenario can be flexibly adjusted to

Figure 1: Macroeconomic environment and times of our surveys



Notes: This figure displays the evolution of the federal funds target rate (left axis) and US inflation (right axis) as well as the timing of our four surveys.

whatever type of policy the researcher is interested in. Second, the within-respondent nature of the design controls for individual-specific measurement error and therefore yields substantial power to precisely estimate average effects of particular policies on expectations, reducing the required sample size. Third, we elicit expectation adjustments under the assumption of full information about the Fed announcement. This makes it possible to examine how aggregate effects vary when changing the fraction of informed households. For instance, one might assume that only those who are typically attentive to Fed announcements respond, or that the Fed reaches more households than usual with a particular announcement.

3.2 Settings

We apply our approach at four different points in time before, during, and after the post-pandemic inflation surge in the US, each time measuring expectation differences under different policy scenarios that were realistic at the time of the survey. Figure 1 highlights the timing of our data collections and the development of inflation and of the federal funds rate over our sample period. Below, we describe our four surveys. The full set of survey instructions can be found in Appendix G.

March 2021: Unconventional monetary policy. Our first data collection took place shortly before the regular FOMC meeting in March 2021. At the time of the survey, the current federal funds rate was near zero and the annual inflation rate was 1.7 percent. There appeared to be broad agreement at the Federal Reserve to keep the federal funds rate close to zero. In our baseline scenario, the current federal funds rate and its projected future value at the end of 2023 remain unchanged at 0.1 percent. In the alternative scenario, the *projected* federal funds rate at the end of 2023 increases from 0.1 to 0.5 percent, while the current federal funds rate remains unchanged.

March 2022: Conventional monetary policy. Our second survey was conducted shortly before the Federal Reserve's March 2022 meeting. The federal funds rate was still close to zero, but inflation had reached very high levels (7.9 percent in February 2022). FOMC members were publicly debating the timing and size of a rate hike and dramatically increased rates over the subsequent months. In our survey's baseline scenario, the *current* federal funds rate remains at 0.1 percent, while it increases to 0.5 percent in the alternative scenario.

September 2022: Conventional monetary policy. We fielded our third survey approximately two weeks before the September 2022 Fed meeting, a period marked by elevated inflation (8.3 percent in August 2022). At that time, the federal funds rate stood at 2.4 percent. In our baseline scenario, the current federal funds rate remains unchanged, while in the alternative scenario, it increases to 3.1 percent.

September 2025: Conventional monetary policy. We conducted our most recent survey shortly before the FOMC meeting in September 2025. The federal funds rate was at 4.4 percent and was expected to be reduced at the meeting. Inflation was back at lower levels, yet still above target (2.9 percent in August 2025). In our baseline scenario, the federal funds rate remains at 4.4 percent. In the alternative scenario, there is a rate cut to 3.9 percent.

State dependence. Our four data collections thus took place in a time period with a rapidly changing economic environment, in which state dependence in how policy changes are viewed could plausibly play a large role. By measuring expectations at each point in time, our approach naturally incorporates any such state dependence.

3.3 Data

We conduct our surveys with samples representing broad segments of the population. While our March 2021 survey (initial $n = 2,209$) was conducted in collaboration with the panel data provider Luc.id, our March 2022 (initial $n = 838$), September 2022 (initial $n = 1,306$) and September 2025 (initial $n = 1,038$) surveys were conducted

with Prolific. Both providers are commonly used in economic research (Haaland et al., 2023).

We apply two sets of restrictions to our samples. First, we drop respondents in the top and bottom percentiles of response time, as very short or very long response time may indicate inattention to our survey. Second, we exclude outliers in elicited point forecasts—a common way of dealing with noise in survey expectations (Armona et al., 2019; Laudenbach et al., 2024). These outliers could reflect typos or inattention during the survey. Even if outliers reflect true beliefs, they will disproportionally affect our model's predicted consumption responses, which are functions of averages over individual survey responses. Appendix D.3 provides details on the exact procedure we apply to exclude outliers. Even though none of our exclusion criteria are restrictive individually, collectively they reduce our sample sizes by more than ten percent due to the high number of forecasts made by each respondent. Our results are robust to varying the exclusion criteria.

Summary statistics of our final samples, including benchmarks from the 2019 American Community Survey (ACS), are shown in Appendix Table A.2. Overall, our final samples resemble the general population fairly closely. Two exceptions are a somewhat higher share of respondents with a college degree, which is a common feature of online surveys (Armantier et al., 2017), and a somewhat lower average age in our Prolific samples.

3.4 Results

We now turn to our main findings on how households adjust their expectations in response to monetary policy announcements. For each survey wave, we compare respondents' forecasts under a policy change scenario (a rate rise or cut) to their forecasts under a no-change baseline. Table 1 summarizes the expectation differences across all four survey waves.

March 2021: Unconventional monetary policy. The first row of Table 1, Panel A illustrates the difference between federal funds rate expectations under the rise scenario (featuring a 0.4 percentage point increase in the *projected* federal funds rate for the end of 2023) and the no-change baseline scenario. It shows that respondents substantially update their federal funds rate expectations when going from the baseline to the rise scenario. The effect peaks for expectations about the rate in 2023 with an increase by 0.18 percentage points ($p < 0.01$), and then reverts back to close to zero for later horizons. The increase corresponds to approximately half of the difference in Fed projections across scenarios. A potential explanation is that the respondents attach positive probability to a state where the Fed will not increase the federal funds rate as

projected.

The second row of Table 1, Panel A highlights that the increase in the projected federal funds rate in 2023 is associated with lower inflation expectations. Inflation expectations decrease by 0.27 percentage points for 2021 ($p < 0.01$), by 0.22 percentage points for 2022 ($p < 0.01$), and somewhat less strongly for some of the later time periods.

The third row of Table 1, Panel A shows that the announcement leads respondents to expect a 0.38 percentage points lower cumulative nominal income growth by 2026 ($p < 0.05$).

March 2022: Conventional monetary policy. The first row of Table 1, Panel B presents the differences in respondents' expectations about the federal funds rate between the rise scenario (featuring a 0.4 percentage point increase in the *current* federal funds rate) and the no-change scenario. In the rise scenario, participants increase their federal funds rate expectations by approximately 0.2 percentage points for the end of 2022, 2023 and 2024 ($p < 0.01$) compared to the baseline scenario. The expectation difference declines somewhat to 0.14 percentage points for 2027 ($p < 0.01$) and reverts to close to zero for 2031. The increases in expectations about the federal funds rate in the initial years correspond to about half of the difference in the current federal funds rate across scenarios. This likely reflects that, also under the baseline scenario, respondents expect rate hikes in later meetings in 2022.

The second row of Table 1, Panel B presents the differences in respondents' inflation expectations between the rise and the no-change scenario. Households *increase* their inflation expectations by 0.13 percentage points for 2022 ($p < 0.01$), rising to 0.25 percentage points for 2024 ($p < 0.01$) and 0.24 percentage points for 2025-2027 ($p < 0.01$). The increase in inflation expectations is consistent with respondents interpreting the policy announcement as a signal of the Fed's information of increased inflationary pressures. This would appear natural given the discussion of whether "inflation is here to stay" at the time of our survey. Alternatively, this evidence is in line with households holding a particular subjective model of the transmission of monetary policy, e.g., a model with a cost channel (Andre et al., 2022). Thus, adjustments of inflation expectations differ from the adjustments we measure for the hypothetical forward guidance announcement in our March 2021 survey.

The third row of Table 1, Panel B shows that households' cumulative expected income growth decreases by 0.55 percentage points by the end of 2027 in response to the rate hike, although this effect misses statistical significance ($p = 0.15$).

September 2022: Conventional monetary policy. Table 1, Panel C highlights qualitatively similar but more pronounced differences in expectations about the federal

Table 1: Expectation differences across monetary policy scenarios

	Year 1	Year 2	Year 3	Year 6	Year 10
	(1)	(2)	(3)	(4)	(5)
Panel A: March 2021 survey					
Δ Expected federal funds rate	0.056***	0.067***	0.184***	0.048**	0.009
	(0.011)	(0.013)	(0.017)	(0.021)	(0.025)
Δ Expected inflation rate	-0.272***	-0.218***	-0.095***	-0.205***	
	(0.022)	(0.025)	(0.031)	(0.035)	
Δ Expected cumulative income growth	-0.190		-0.112	-0.382**	
	(0.145)		(0.163)	(0.181)	
Observations	1,871	1,871	1,871	1,871	1,871
Panel B: March 2022 survey					
Δ Expected federal funds rate	0.200***	0.204***	0.183***	0.138***	0.031
	(0.020)	(0.023)	(0.025)	(0.028)	(0.031)
Δ Expected inflation rate	0.133***	0.163***	0.254***	0.240***	
	(0.042)	(0.047)	(0.052)	(0.056)	
Δ Expected cumulative income growth	-0.145		0.300	-0.551	
	(0.320)		(0.326)	(0.385)	
Observations	692	692	692	692	692
Panel C: September 2022 survey					
Δ Expected federal funds rate	0.619***	0.650***	0.615***	0.554***	0.482***
	(0.020)	(0.021)	(0.022)	(0.023)	(0.027)
Δ Expected inflation rate	0.427***	0.399***	0.392***	0.262***	
	(0.034)	(0.038)	(0.039)	(0.041)	
Δ Expected cumulative income growth	-0.223		-0.335	-0.609**	
	(0.214)		(0.253)	(0.288)	
Observations	1,106	1,106	1,106	1,106	1,106
Panel D: September 2025 survey					
Δ Expected federal funds rate	-0.106***	-0.091***	-0.073**	-0.025	0.053*
	(0.031)	(0.030)	(0.029)	(0.030)	(0.030)
Δ Expected inflation rate	0.043	-0.031	-0.094***	-0.115***	
	(0.029)	(0.030)	(0.030)	(0.035)	
Δ Expected cumulative income growth	-0.019		0.429	-0.185	
	(0.224)		(0.271)	(0.317)	
Observations	902	902	902	902	902

Notes: This table shows the effect of the hypothetical increase in the Fed's projection of the future federal funds rate at the end of 2023 from 0.1 to 0.5 percent in March 2021 (Panel A), of the hypothetical increases in the actual federal funds rate from 0.1 to 0.5 percent in March 2022 (Panel B) and from 2.4 to 3.1 percent in September 2022 (Panel C), and of the hypothetical decrease in the actual federal funds rate from 4.4 to 3.9 percent in September 2025 (Panel D) on respondents' own expectations about the federal funds rate, inflation and the cumulative growth of nominal household net income at different horizons. "Year 1" indicates the calendar year in which the survey is conducted (the end of the year for the expected federal funds rate), "Year 2" indicates the next calendar year, and so on. The samples are based on the March 2021 (Panel A), March 2022 (Panel B), September 2022 (Panel C), and September 2025 surveys (Panel D). Robust standard errors are in parentheses. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

funds rate and about inflation between the rise scenario (featuring a 0.7 percentage point increase in the *current* federal funds rate) and the no-change scenario relative to the March 2022 survey. Respondents now also expect a stronger and statistically significant reduction in nominal income growth in response to the federal funds rate increase. Significant reductions in expected income growth might reflect that the Fed emphasized the potential cost of disinflation.[5]

September 2025: Conventional monetary policy. The first row of Table 1, Panel D highlights that respondents expect the federal funds rate at the end of 2025 to be 0.11 percentage points lower in the scenario featuring a rate cut of 0.5 percentage points. This suggests that the respondents expect cuts later in the year in the no-change scenario. The perceived difference in the federal funds rate across scenarios fades over time, going back to close to zero by 2031. The second row of Panel D shows that respondents expect about 0.1 percentage points lower inflation for later horizons between 2027 and 2030 in the decrease scenario ($p < 0.05$). A potential explanation is a signaling channel, where respondents conclude that a rate cut reflects an improved outlook for inflation. The third row of Panel D shows that the announcement does not significantly affect nominal income expectations over any horizon.

State dependence and comparison to a benchmark. Our exercise yields estimates of the causal effects of different monetary policy announcements on household expectations. We detect some important differences in the effects of policy announcements over time: first, contractionary unconventional policy in 2021 reduces households' inflation expectations (in line with textbook logic), whereas contractionary conventional policy in 2022 is associated with an *increase* and, conversely, accommodative conventional policy in 2025 with a *decrease* in expected inflation; second, the strength of adjustments in nominal income expectations varies across the different announcements. These patterns are consistent with state dependence in how monetary policy affects household expectations.[6] The expectation differences across policies appear quite natural in light of the developments over our study period, such as the debate whether inflation was "here to stay" in early 2022 and the Fed emphasizing hardship through monetary policy in mid-2022.

The expectation differences across policies summarized in Table 1 are difficult to

[5] At the Jackson Hole conference in August 2022, the Federal Reserve Chair emphasized that higher interest rates will bring some pain to households and businesses. This speech by Federal Reserve Chair Jerome H. Powell was widely covered in the news media and may have affected households' views ahead of the September 2022 FOMC meeting.

[6] In unreported regressions, we find that expectation responses do not differ strongly by observables within the different samples. This suggests that the differences in findings across the four surveys reflect differences in the economic environment rather than a differential selection of respondents. That said, our main goal is to establish an approach that is *robust* to state dependence—rather than showing that there *was* state dependence during our sample period.

reconcile with the textbook full-information rational expectations equilibrium of a New Keynesian model, where a higher policy rate, for a given state of the economy, reduces both inflation and nominal income expectations.

Our empirical findings thus highlight the value of an approach for the computation of policy counterfactuals that is (i) fully robust to state dependence in how monetary policy announcements affect household expectations and (ii) agnostic about how those expectations are formed. In the next section, we implement such an approach by combining the consumption theory of a canonical HANK model with our data on interest, income, and inflation expectations under different policy scenarios.

Extensions. In Appendix D.4 we present some extensions of our exercise. First, we show that the measured expectation adjustments in our March 2021 survey do not vary strongly when providing respondents with different reasons for the change in the Fed's projections. Second, we use an auxiliary experiment to show that home price expectations *increase* in response to a higher projected future federal funds rate, although this estimate does not reach statistical significance.

4 Consumption with measured expectations

We feed the measured expectation differences across policy scenarios from Section 3 into the Jacobians of the household block outlined in Section 2. The survey elicits each household's expected path for the federal funds rate, the inflation rate, and after-tax nominal income under the baseline and the alternative policy announcement.

The survey measures expectations about annual variables, while the model requires quarterly paths. When a household reports that it expects $x\%$ inflation for a calendar year, we turn this answer into an expectation of $\frac{1}{4}x\%$ inflation for each quarter of the year; for nominal income expectations we proceed analogously.[7] For interest rate expectations, we interpolate the expected path across intermediate quarters. Beyond the survey horizons, we assume expectation differences decay at quarterly rate $\delta = 0.2$; robustness checks using alternative values of δ yield nearly identical results. Appendix C provides further details of how the model inputs are derived from the survey responses.

The average expected paths $\{dr_s^{survey}\}$ and $\{dY_s^{survey}\}$ are then substituted into equation (8) to compute the future-expectations term Z_0, and the period-zero outcome is determined through goods market clearing as in equation (10). The Jacobians are computed from the HANK model of Auclert et al. (2025), calibrated with a coefficient of relative risk aversion of $\gamma = 3$ (EIS $= 1/3$), an average marginal propensity to

[7] It matters very little how a calendar-year expectation is distributed across the different quarters of the year; see Appendix C for details.

consume of approximately 0.15, and a wealth distribution consistent with U.S. data.[8]

Results. Table 2 presents the model-implied aggregate consumption response and its channel decomposition for each of our four survey waves. Our baseline results exclude the valuation channel, which requires additional data on asset price expectations that we only have for the March 2021 survey (see Section 4.6).

Table 2: Model-based consumption responses across survey waves

	Total dC_0	Interest rate	Income
Panel A: March 2021 (Forward Guidance)	$+0.27$	$+0.07$	$+0.20$
Panel B: March 2022 (Rate Hike)	-0.56	$+0.00$	-0.56
Panel C: Sep 2022 (Rate Hike)	-0.96	$+0.22$	-1.18
Panel D: Sep 2025 (Rate Cut)	$+0.08$	0.00	$+0.08$

Notes: This table shows the aggregate consumption response on impact and its channel decomposition for each of the four survey waves implied by the HANK model from Section 2. "Interest rate" captures the combined effect of changes in the current and expected future path of real interest rates, including both intertemporal substitution and the income effect of interest rate changes on savers and borrowers. "Income" captures the effect of expected changes in the path of real after-tax income.

4.1 Conventional monetary policy

We first apply our approach to conventional monetary policy using our March 2022, September 2022, and September 2025 surveys.

March 2022. The March 2022 survey features a 40 basis point increase in the current federal funds rate (from 0.1 to 0.5 percent). At the time, inflation had reached very high levels and FOMC members were publicly debating the timing and size of an interest rate increase. Feeding the measured expectation differences into the model, we find that the rate hike would have *reduced* aggregate consumption by 0.56 percent on impact (Table 2, Panel B).

The decomposition reveals that the income channel drives essentially the entire effect, contributing -0.56 percentage points, while the real interest rate channel is negligible. The dominance of the income channel reflects that respondents increase their inflation expectations in response to the rate hike (Table 1, Panel B), consistent with interpreting the policy announcement as a signal of the Fed's information about increased inflationary pressures. Since nominal income expectations do not respond significantly, higher expected inflation translates into lower expected real income, which lowers consumption. This signaling channel of monetary policy is a form of state dependence that our approach naturally captures.

September 2022. The September 2022 survey features a 70 basis point increase in the current federal funds rate (from 2.4 to 3.1 percent). Inflation was elevated (8.3

[8]Appendix B explains the computation and Appendix E shows the results for alternative calibrations.

percent in August 2022) and the Federal Reserve Chair had emphasized the potential costs of disinflation at the Jackson Hole conference.

The model predicts an aggregate consumption decline of 0.96 percent on impact (Table 2, Panel C). The income channel contributes -1.18 percentage points—reflecting both stronger inflation expectations responses and, different from the March 2022 survey, a statistically significant reduction in nominal income expectations at the longest horizon (Table 1, Panel C). The real interest rate channel partially offsets this decline, contributing $+0.22$ percentage points. With EIS $= 1/3$, the income effect of higher expected real interest rates outweighs the substitution effect, so that higher expected future rates *raise* consumption. Nevertheless, the labor income channel dominates, leaving a substantial negative overall effect. In Appendix E we report the consumption response under a higher intertemporal elasticity of substitution. In that case, the real interest rate channel negatively impacts consumption; however, the overall results are similar because the income channel is the key force driving the consumption response.

September 2025. The September 2025 survey features a 50 basis point decrease in the current federal funds rate (from 4.4 to 3.9 percent). The federal funds rate was expected to be reduced at the meeting, and inflation was back at lower levels.

The model predicts a small increase in aggregate consumption of 0.08 percent on impact (Table 2, Panel D). The income channel contributes $+0.08$ percentage points, while the real interest rate channel is negligible (essentially zero). The small magnitude reflects that the measured expectation differences across the two scenarios are modest: respondents expect the policy rate to converge to similar levels over the medium term regardless of the short-term decision, and neither inflation nor income expectations respond strongly.

Role of attention. In Appendix D.5 we report consumption responses under the assumption that only attentive households react to Fed announcements. The magnitudes attenuate substantially. For instance, the September 2022 response shrinks from -0.96 to -0.47 percent.

4.2 Unconventional monetary policy

We now turn to unconventional monetary policy, applying our approach to the March 2021 forward guidance survey. In this setting, monetary policy operates not through current interest rate changes but through communication about future rates.

March 2021. For the March 2021 forward guidance announcement—a 40 basis point increase in the projected federal funds rate at the end of 2023—the baseline model predicts that aggregate consumption *increases* by 0.27 percent on impact (Table 2,

Panel A). The income channel contributes $+0.20$ percentage points—the bulk of the response—while the real interest rate channel contributes $+0.07$ percentage points.

The positive response illustrates the dominance of the income channel. The forward guidance announcement lowers inflation expectations by more than it lowers nominal income expectations (Table 1, Panel A), so expected real income rises on net, pushing consumption up. The real interest rate channel reinforces this: with EIS $= 1/3$, the income effect of higher expected real interest rates—households earn more on their savings—dominates the substitution effect. Both channels therefore push consumption upward. The modest overall magnitude reflects that the expectation differences across policy scenarios are themselves of modest size.

State dependence. The results across our four survey waves illustrate important state dependence in the effects of monetary policy on consumption. The same direction of policy—a rate hike—generates a consumption decline of -0.56 percent in March 2022 but a larger decline of -0.96 percent in September 2022, driven by stronger income expectations responses after the Fed's emphasis on the costs of disinflation. Meanwhile, forward guidance in March 2021 produces a *positive* consumption response of $+0.27$ percent. Again, the income channel is the key driver: lower inflation expectations raise expected real income, and this effect is strong enough to make consumption increase rather than decline. This variation in outcomes—same direction of policy but different magnitudes and even different signs—underscores the value of measuring expectations at each point in time rather than imposing a single model of expectation formation.

4.3 The covariance between Jacobians and expectations

Having established the aggregate consumption responses, we now turn to the covariance term in equation (13)—how much the correlation between individual Jacobians and individual expectations matters for the aggregate response—using the September 2022 experiment as a case.

Table 3 reports this decomposition for the September 2022 experiment. Row (A) reports the consumption response implied by feeding the *average* expectation paths into the *aggregate* Jacobians—the standard approach using equation (7). Row (B) reports the mean of individual-level consumption responses, where each household's own Jacobians—interpolated to her position in the income-wealth distribution—are applied to her own expectations.[9] The difference—reported in the bottom row—is the covariance between individual Jacobians and individual expectations.

The covariance correction is quantitatively important. For the income channel, it amounts to -0.64 percentage points, amplifying the aggregate income-driven

[9] We extend the SSJ approach to efficiently compute individual-level Jacobians, see Appendix B.

Table 3: Decomposition of aggregate consumption response: September 2022

	Rate	Income	Total
(A) $\bar{\mathcal{M}} \cdot \bar{E}$ (Avg $\times$ Avg)	$+0.31$	-0.87	-0.57
(B) $\int m_i \cdot E_i \, d\mu(i)$ (Individual mean)	$+0.63$	-1.52	-0.88
(B$-$A) $\sum_s \mathrm{Cov}(m_{s,i}, E_{s,i})$	$+0.32$	-0.64	-0.32

Notes: All entries in percent of steady-state consumption, computed as partial-equilibrium objects $\sum_s \mathcal{M}_s \cdot E_s$ without the general-equilibrium multiplier $1/(1-\mathcal{M}_0^Y) \approx 1.68$ from equation (10). Applying this multiplier to Row (A) yields the aggregate consumption response of -0.96 percent reported in Table 2. Row (B) reports the mean of individual partial-equilibrium consumption responses. The difference is the covariance term in equation (13).

consumption decline from -0.87 to -1.52 percent. This indicates that households with high intertemporal MPCs—those with low wealth and tight borrowing constraints—also tend to expect larger income declines in the hike scenario. For the rate channel, the covariance is positive ($+0.32$ percentage points), reflecting heterogeneity in both the interest-income effect and intertemporal substitution, i.e., in households' overall rate-channel responses. On net, accounting for the covariance between Jacobians and expectations increases the total consumption decline by about 56 percent relative to the average benchmark.

4.4 Consumption dynamics with learning

Our baseline analysis solves for the equilibrium outcome at $t = 0$ and takes survey expectations for future periods as given. A natural question is how consumption dynamics evolve over time if agents gradually revise their beliefs as they observe equilibrium outcomes that differ from their initial expectations. In this subsection, we explore this by introducing a simple constant-gain learning rule: at each period, agents update their expectations toward the realized equilibrium, and we trace out the resulting consumption path.

Setup. At each date t, the economy is solved for the equilibrium values $(dY_t^{eq}, d\pi_t^{eq})$ given agents' current beliefs about the future path of inflation, the nominal rate, and aggregate income. These belief paths are initialized at the survey expectations,

(14)
$$d\pi_{s|0}^{belief} = d\pi_s^{survey}, \qquad di_{s|0}^{belief} = di_s^{survey}, \qquad dY_{s|0}^{belief} = dY_s^{survey}, \qquad \text{for all } s \geq 1.$$

Here $d\pi_{s|0}^{belief}$ denotes the expectation about inflation in period s at the time of decision-making in period zero, expressed as a difference across the two policy announcements. In the following, $d\pi_{s|t}^{belief}$ denotes the expectation about inflation in period s at the time of decision-making in period t, which may differ from $d\pi_{s|0}^{belief}$ due to updating. After observing the equilibrium at $t-1$ and comparing it to the expectation for $t-1$

at the time of decision-making in period $t-1$, agents revise their beliefs for every future horizon $s \geq t$ by a fraction g of the period-$(t-1)$ surprise, in the spirit of the constant-gain learning literature (Evans and Honkapohja, 2012); Appendix F derives the updating rule from a standard constant-gain learning microfoundation. For inflation, this gives, for all $t \geq 2$ and $s \geq t$,

$$d\pi^{belief}_{s|t} = d\pi^{belief}_{s|t-1} + g\,\rho^{s-(t-1)}\left(d\pi^{eq}_{t-1} - d\pi^{belief}_{t-1|t-1}\right), \tag{15}$$

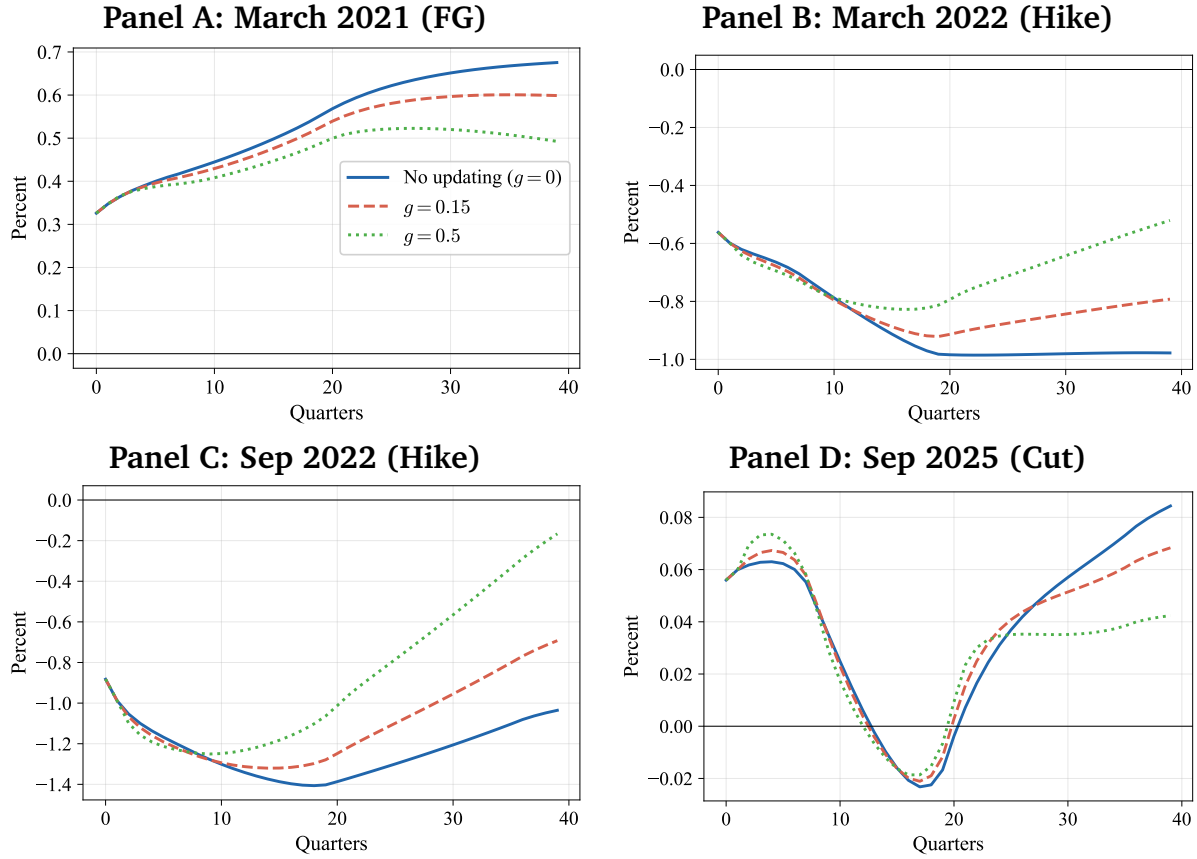
and analogously for the nominal-rate and income belief paths. Two features of (15) are worth emphasizing. First, the kernel $\rho^{s-(t-1)}$ corresponds to the implicit AR(1) decay rate with which the survey responses are extrapolated beyond the survey horizon ($\rho = 0.8$); we use the same coefficient for all three updated variables, so that the revision of a long-horizon belief attenuates geometrically with the distance from the period in which the surprise occurred. Second, as the surveys ask for calendar-year expectations and we distribute calendar-year expectations equally across the quarters following the survey date (Appendix C), we assume that the first update occurs at $t = 2$. Throughout $t \geq 1$ we re-solve the period-t equilibrium using the prevailing beliefs, while the household's consumption response at t is computed from the partial-equilibrium Jacobians of Section 2, evaluated at the path actually held by the household at date t. The parameter g governs the speed of learning: $g = 0$ corresponds to no updating, $g = 0.15$ is a standard value in the constant-gain learning literature, and $g = 0.5$ represents very fast updating.

Results. Figure 2 shows the consumption impulse response functions for $g \in \{0, 0.15, 0.5\}$. Each panel corresponds to one of our four survey waves. By construction, the impact response at $t = 0$ is identical across g, because the household has not yet observed any equilibrium outcome and still holds exactly the survey expectations; the paths only begin to differ from $t = 2$ onwards, once the first surprise has been incorporated into beliefs.

Several patterns emerge. First, for Panel A (March 2021, forward guidance), the impact response of around $+0.3$ percent is identical across g by construction, but the paths diverge over time. Without updating ($g = 0$), consumption continues to rise as households retain their initial optimistic survey expectations, reaching roughly $+0.7$ percent after ten years. Faster learning *dampens* this build-up: under $g = 0.5$ the response peaks near $+0.5$ percent and then drifts back down. The reason is that equilibrium output rises by less than the survey path predicts, generating negative income surprises; as agents revise their beliefs downward, the consumption response is muted relative to the no-updating benchmark.

Second, for Panels B and C (March 2022 and September 2022, rate hikes), the same logic operates in reverse. Without updating, the consumption decline persists or even

Figure 2: Consumption dynamics with learning



Notes: This figure shows consumption impulse response functions under different speeds of constant-gain learning. At each period t, the equilibrium is solved given agents' current beliefs; after observing the equilibrium at $t-1$, agents revise their beliefs for every future horizon $s \geq t$ by a fraction g of the period-$(t-1)$ surprise, with a geometric attenuation $\rho^{s-(t-1)}$ ($\rho = 0.8$). Updates begin at $t = 2$. $g = 0$ corresponds to no updating; $g = 0.15$ is a standard value in the constant-gain learning literature; $g = 0.5$ corresponds to very fast updating.

deepens: in Panel C the trough reaches about -1.4 percent and the response remains close to its trough for the entire horizon. Faster learning makes the trough *shallower* and the subsequent recovery markedly faster: under $g = 0.5$ consumption in Panel C recovers from a trough near -1.25 percent back to roughly -0.2 percent by the end of the horizon. In these episodes the equilibrium contraction in output and the path of real rates are less severe than what the surveys imply, so updating generates positive surprises that progressively offset the initial pessimism.

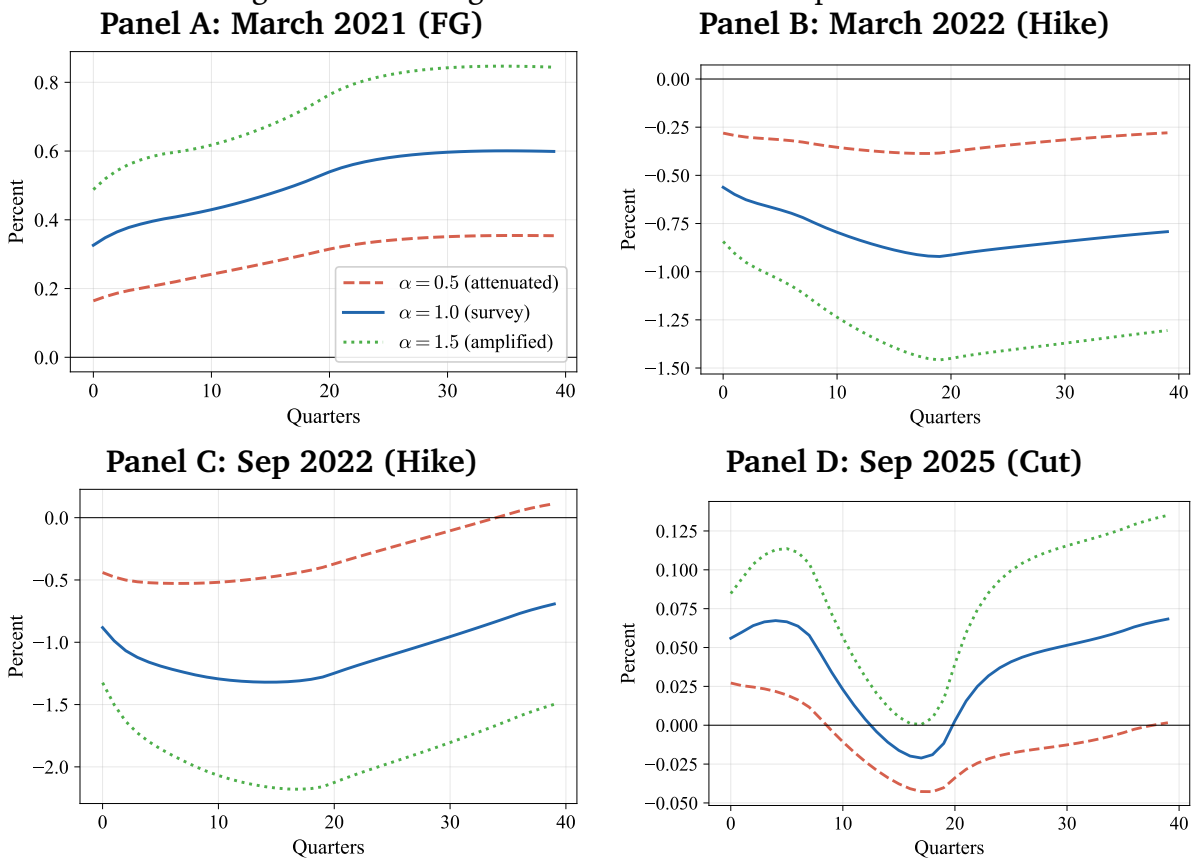
Third, in Panel D (September 2025, rate cut) the consumption difference across policies remains small in all quarters, and updating attenuates the small difference even further in the medium horizon. The consumption difference across policies turns two basis points negative after a few quarters before recovering, because the three expectation differences across policies (Table 1, Panel D) have opposite effects on consumption with time-varying strengths.

Overall, we find across all four waves that a constant-gain learning rule tends to mute

the consumption difference across policies in later quarters.

Sensitivity to initial expectations. Initial expectations are important because they affect both the term $d\pi^{eq}_{t-1}$ and the term $d\pi^{belief}_{t-1|t-1}$ in equation (15). To illustrate the importance of initial expectations, Figure 3 holds the gain parameter fixed at $g = 0.15$ and instead varies the initial expectations. Specifically, we scale all three survey-measured expectation paths—income, inflation, and the nominal interest rate—by a common factor α, where $\alpha = 1$ corresponds to the baseline survey expectations, $\alpha = 0.5$ attenuates them by half, and $\alpha = 1.5$ amplifies them by 50 percent. The realized exogenous policy rate (the monetary policy shock fed into the equilibrium) is identical across all cases; only the agents' *expectations* about that rate, together with their inflation and income expectations, are scaled.

Figure 3: Learning with different initial expectations



Notes: This figure shows consumption impulse response functions when the gain parameter is held fixed at $g = 0.15$ and all three survey-measured expectation paths (income, inflation, and the nominal interest rate) are scaled by a common factor α. $\alpha = 1$ corresponds to the baseline survey expectations; $\alpha = 0.5$ attenuates them by half; $\alpha = 1.5$ amplifies them by 50 percent.

The figure confirms that the initial point of expectations matters substantially for the entire consumption path. By construction the impact response at $t = 0$ is exactly linear in α, since at that date the household reacts only to its survey-based beliefs. More importantly, this scaling persists over time: the $\alpha = 0.5$ and $\alpha = 1.5$

paths do not converge to a common trajectory over the horizons we consider. In Panel C (September 2022), for example, attenuating initial expectations to $\alpha = 0.5$ roughly halves the consumption decline relative to the baseline, while amplifying them to $\alpha = 1.5$ raises it by 50 percent, and these differences propagate through the entire path. The measured survey expectations are therefore not merely a starting point that is quickly "washed out" by learning—rather, they permanently shape the equilibrium consumption trajectory. This provides further motivation for our approach of disciplining expectations with survey data rather than imposing a fixed expectation formation process.

4.5 Validation

We validate our model-based consumption predictions using the September 2022 survey described in Section 3, which additionally elicits respondents' self-reported consumption adjustments across scenarios. Appendix Table A.2 (Panel C) provides summary statistics.

Design. As in the main experiment on conventional monetary policy, we present respondents with two scenarios: a no-change scenario where the Fed keeps the federal funds rate at 2.4 percent and a rise scenario where the Fed increases the federal funds rate from 2.4 to 3.1 percent. Our design is identical to the March 2022 experiment except that we additionally elicit differences in expected spending plans across the scenarios. Appendix G.3 provides the full set of experimental instructions.

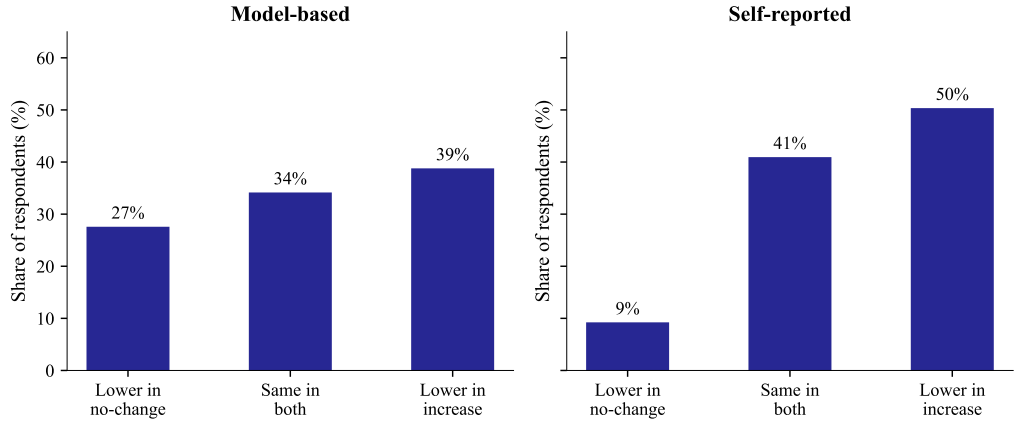
Self-reported data on household spending is known to be subject to a high level of measurement error (Bound et al., 2001; Browning et al., 2003).[10] We take two steps to mitigate these challenges: (i) we elicit beliefs about quantities purchased rather than spending in nominal terms and (ii) we elicit consumption plans in the simplest possible way using qualitative questions. After completing the two scenarios, we ask respondents under which scenario their household would make fewer purchases of non-durable goods and services, such as food, entertainment services, or clothing. The answer options are (i) in the no-change scenario, (ii) same in both scenarios, and (iii) in the rise scenario.

Aggregate validation. Figure 4 compares the fractions of households reporting that they would purchase fewer non-durable goods and services in one of the scenarios with the model-based predictions. 50 percent of respondents expect fewer non-durable purchases in the rate increase scenario compared to 39 percent according to the model. 41 percent expect the same level of non-durable purchases across the two scenarios

[10] In the context of self-reported expectations of future spending, Galashin et al. (2026) document a very noisy relationship between spending plans and realized spending as measured in credit card data.

compared to 34 percent predicted by the model.[11] Only 9 percent report fewer non-durable purchases in the no-change scenario relative to 27 percent in the model. The model correctly identifies the rate increase scenario as the one in which most respondents expect to cut spending.

Figure 4: Distributions of model-based and self-reported consumption responses to conventional monetary policy: September 2022 survey



Notes: This figure displays the distributions of model-based and self-reported consumption responses to the hypothetical increase in the federal funds rate from 2.4 to 3.1 percent in September 2022. The figure displays the shares of respondents for which the model predicts consumption to be more than one percent lower in the no-change scenario, equal across the no-change and the increase scenario (i.e., difference at most one percent), or more than one percent lower in the increase scenario, respectively (left). The figure also displays the shares of respondents reporting that their household would make fewer purchases of non-durable goods and services under the no-change or the federal funds rate increase scenario, respectively, as well as the share reporting that purchases would be equal across scenarios (right). The distributions are weighted by the respondents' total household spending in 2021.

Individual-level validation. Our model also generates individual-level consumption predictions for each respondent, based on their individual expectation responses and the gridpoint-level Jacobians from the HANK model. This allows us to ask a sharper validation question: are households who report that they would cut spending in the rate hike scenario also the households for whom the model predicts a larger consumption decline?

Table 4 shows the correlation of a dummy variable taking value one if a respondent expects fewer non-durable purchases in the increase scenario with the continuous model-implied consumption difference. The total model-implied consumption response is significantly negatively correlated with self-reported spending cuts ($p < 0.01$), validating the overall model predictions (Column 1).

We further decompose the individual model-implied consumption responses into their constituent channels—the real interest rate channel and the income channel—and examine whether each component is correlated with the self-reported consumption

[11] For the model-based estimates, the no-change category captures respondents whose consumption would not differ by more than one percent across the two scenarios.

adjustments. The rate channel (Column 2) and the income channel (Column 3) are both significantly negatively correlated with the self-reported spending reductions: respondents for whom the model predicts a larger decline through either channel are indeed more likely to report fewer purchases. In Appendix E we show that the rate channel does not explain individual responses under a higher intertemporal elasticity of substitution.

Table 4: Correlation between model-based and self-reported consumption responses

	Total	Rate channel	Income channel
	(1)	(2)	(3)
Model-based dC (%)	-0.308***	-0.468**	-0.382***
	(0.102)	(0.237)	(0.134)
Observations	1106	1106	1106

Notes: Each column reports the OLS coefficient from regressing a dummy variable (multiplied by 100) indicating whether the respondent reports fewer non-durable purchases in the rate increase scenario on the model-based consumption response (%). Column (1) uses the total model-implied consumption response (rate + income channels). Column (2) uses the rate channel only. Column (3) uses the income channel only. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Summary. Taken together, respondents' self-reported consumption responses provide a similar picture as the model-implied responses: both the aggregate distribution and the individual-level cross-sectional variation are aligned. These findings corroborate the validity of our approach.

Our model-based approach has advantages compared to directly eliciting consumption responses. First, it circumvents the problem of what respondents "hold fixed" when reporting consumption changes. In our approach, direct and indirect effects are both captured because they operate through expectations of the interest rate, inflation, and income paths, all of which are elicited for both scenarios. Second, we can study how the consumption path evolves when agents gradually update their expectations toward realized equilibrium outcomes (Section 4.4). Third, one can vary model inputs, such as the degree of attention to Fed announcements, and examine how such changes affect predicted consumption responses.

4.6 Valuation channel

We now turn to an additional channel: changes in expected future interest rates affect asset valuations, which in turn influence household consumption through wealth effects.

The valuation channel. The baseline consumption equation (7) captures effects through expected real interest rates and income. In any HANK model with long-lived

assets, however, changes in expected real interest rates also affect the present value of those assets. These asset price changes generate an additional *valuation channel* through which monetary policy affects consumption. To capture this, we extend the aggregate consumption equation to include a third set of Jacobians:

$$dC_0 = \sum_{s=0}^{T-1} \mathcal{M}_s^r \cdot dr_s + \sum_{s=0}^{T-1} \mathcal{M}_s^Y \cdot dY_s + \sum_{s=0}^{T-1} \mathcal{M}_s^p \cdot dp_s \tag{16}$$

The coefficient $\mathcal{M}_s^p$ measures how aggregate consumption today responds to a change in asset prices at date s as discussed in Auclert et al. (2025). Higher asset prices raise the wealth of asset holders, which increases their consumption—particularly for households closer to borrowing constraints. Whether this channel amplifies or dampens the overall consumption response depends on the sign and magnitude of asset price changes, which themselves depend on how interest rate and income expectations shift across policy scenarios.

Baseline model. Recall that for the March 2021 forward guidance announcement—a 40 basis point increase in the projected federal funds rate at the end of 2023—the baseline model (excluding the valuation channel) predicts that aggregate consumption *increases* by 0.27 percent on impact (Table 2, Panel A). The income channel contributes $+0.20$ percentage points—the bulk of the response—while the real interest rate channel contributes $+0.07$ percentage points.

Valuation effects. For the March 2021 survey, we have additional data in which a subset of respondents report their expectations about the value of their main residence at the end of 2023 under the two policy scenarios. Using the model-implied valuation Jacobians $\mathcal{M}_s^p$ in equation (16) and the model-implied asset prices, the model predicts a *negative* valuation effect of -0.11 percentage points as higher rates depress asset prices. This partially offsets the positive rate and income channels and reduces the total consumption response from $+0.27$ to $+0.16$ percent.

However, the survey-measured home price expectations tell a different story. Respondents on average expect home prices to *increase* by 0.91 percentage points more in the rise scenario, although this estimate misses statistical significance (see Appendix D.4 for details). Disciplining the valuation channel with these measured home price expectations yields a *positive* valuation effect of $+0.13$ percentage points, bringing the total consumption response to $+0.40$ percent. This contrast highlights the sensitivity of the valuation channel to assumptions about asset price expectations and motivates our baseline approach of presenting results without the valuation channel for surveys where we lack direct data on asset price expectations.

5 Conclusion

The Lucas critique implies that policy evaluations based on historical correlations can fail because policy changes alter how agents form expectations. We develop a new approach that sidesteps this concern and apply it to monetary policy: rather than imposing assumptions about expectation formation, we elicit expectations under alternative policy scenarios in household surveys and feed these measured expectations into the consumption block of a canonical heterogeneous-agent New Keynesian model.

Across four monetary policy announcements before, during, and after the post-pandemic inflation surge, our surveys reveal that the response of inflation and income expectations to interest rate changes is strongly state-dependent. Feeding these expectation differences into the model yields consumption responses that vary with the economic context: the same direction of policy can produce movements of different magnitudes and even opposite signs, with the income channel dominating throughout. Exploiting individual-level data, we further find that the covariance between household-level Jacobians and household-level expectations substantially amplifies the aggregate response—a channel that is invisible to approaches working with average expectations alone. In principle, this approach could be applied routinely before monetary policy meetings, providing policymakers with consumption forecasts that reflect how expectations would actually react to alternative announcements in the prevailing economic context.

The approach extends naturally to other settings where expectation formation is plausibly state-dependent and where expectations about non-policy variables such as income, inflation, or asset prices play a central role. Promising applications include fiscal policy, where surveys could elicit expectations across alternative tax or spending scenarios to discipline consumption and investment responses, and macroprudential policy, where one could measure how expectations adjust to interventions designed to contain bank runs or credit booms. More broadly, treating measured expectations as direct inputs into structural models offers a tractable path toward policy evaluation that is robust to the way expectations are formed.

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Online Appendix: Macro Theory with Measured Expectations

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Summary of the Online Appendix

Section A provides proofs for the theoretical model.

Section B describes our numerical algorithm to solve the HANK model.

Section C demonstrates how to derive model inputs from the survey responses.

Section D provides additional details on the data.

Section E shows the model results for alternative calibrations.

Section F derives the constant-gain learning rule used in Section 4.4.

Section G provides the experimental instructions.

A Proofs

In this Appendix, we derive equation (5) in the paper under very weak assumptions about knowledge and beliefs of the household.

Notation. Let z_t denote the vector of exogenous shocks that nature draws in period t. Let the history of exogenous shocks up to and including period t be denoted by $z^t = \{z_{-1}, z_0, z_1, \ldots, z_t\}$, where—with some abuse of notation—z_{-1} denotes the vector of initial conditions that nature drew before period zero. Let s_{it} denote the vector of signals observed by household i in period t. Let the information set of household i in period t be denoted by $s_i^t = \left\{s_i^{-1}, s_{i0}, s_{i1}, \ldots, s_{it}\right\}$, where s_i^{-1} denotes the vector of variables that the household had observed before period zero. We assume that z^t is drawn from a finite set Z^t and s_i^t is drawn from a finite set S_i^t. Let $p_{i0}\left(z^t, s_i^t\right)$ denote household i's subjective probability in period zero of the realization $\left(z^t, s_i^t\right)$. Finally, let X_t denote the value of endogenous variable X in period t and let $X_{i0}\left(z^t\right)$ denote household i's subjective belief in period zero about the value of X_t at history z^t.

This setup is very general. It imposes no restrictions on the exogenous histories, z^t, the information sets, s_i^t, the subjective probabilities, $p_{i0}\left(z^t, s_i^t\right)$, and the subjective models, $X_{i0}\left(z^t\right)$, apart from the finiteness of the set of possible realizations of $\left(z^t, s_i^t\right)$.

The standard procedure in macro theory is to impose additional restrictions on these objects. For example, the assumption of full-information rational expectations is nested as a special case by imposing the restriction of rational expectations (the *subjective* probability $p_{i0}\left(z^t, s_i^t\right)$ equals the *objective* probability of the realization $\left(z^t, s_i^t\right)$ given information s_i^0, and the *subjective model* $X_{i0}\left(z^t\right)$ equals the *equilibrium outcome* of variable X_t at history z^t) and the assumption of full information (here, $s_i^t = z^t$).

Statement of the decision problem. With this notation, expected utility of the household in period zero can be written as

$$E_{i0}\left[\sum_{t=0}^{\infty}\beta^t\left(\frac{c_{it}^{1-\gamma}}{1-\gamma}-v\left(n_{it}\right)\right)\right]=\sum_{t=0}^{\infty}\sum_{z^t\in Z^t}\sum_{s_i^t\in S_i^t}p_{i0}\left(z^t,s_i^t\right)\beta^t\left(\frac{c\left(s_i^t\right)^{1-\gamma}}{1-\gamma}-v\left(n\left(s_i^t\right)\right)\right), \tag{17}$$

and the household's period-zero belief about its asset holdings in any future period $t > 0$ are given by:

$$a_{i0}\left(z^t,s_i^t\right)=(1+i_{i0}(z^{t-1}))a_{i0}\left(z^{t-1},s_i^{t-1}\right)+(1-\tau)w_{i0}\left(z^t\right)e_{i0}\left(z^t\right)n\left(s_i^t\right)+d_{i0}\left(z^t\right)-P_{i0}\left(z^t\right)c\left(s_i^t\right). \tag{18}$$

Here $a_{i0}\left(z^t, s_i^t\right)$ denotes household i's period-zero belief about its nominal asset holdings at the realization $\left(z^t, s_i^t\right)$. The last equation follows from the flow budget constraint and the household's period-zero belief about the sequence of own choices at information set s_i^t and the sequence of endogenous variables at history z^t. For example, $i_{i0}(z^{t-1})$ denotes household i's period-zero belief about the nominal interest rate between periods $t-1$ and t at history z^{t-1}.

If the household is not borrowing constrained in period zero and believes that it will not be borrowing constrained in future periods, then the household's decision problem is to make a plan

for consumption and hours worked $\left\{c\left(s_i^t\right), n\left(s_i^t\right)\right\}_{t=0}^{\infty}$, with $c\left(s_i^t\right) \in \mathbb{R}_{++}$ and $n\left(s_i^t\right) \in \mathbb{R}_{+}$, so as to maximize expected utility (17) subject to equation (18) and a no Ponzi scheme condition.

Derivation of equation (5). Dividing equation (18) by the price level and defining the household's period-zero belief about real asset holdings at realization $\left(z^t, s_i^t\right)$, $\tilde{a}_{i0}\left(z^t, s_i^t\right) = \frac{a_{i0}\left(z^t, s_i^t\right)}{P_{i0}\left(z^t\right)}$, the household's period-zero belief about real non-interest income at realization $\left(z^t, s_i^t\right)$, $\tilde{y}_{i0}\left(z^t, s_i^t\right) = \frac{(1-\tau) w_{i0}\left(z^t\right) e_{i0}\left(z^t\right) n\left(s_i^t\right) + d_{i0}\left(z^t\right)}{P_{i0}\left(z^t\right)}$, and the household's period-zero belief about the real return at history z^t, $\tilde{r}_{i0}\left(z^t\right) = \frac{(1+i_{i0}(z^{t-1})) P_{i0}\left(z^{t-1}\right)}{P_{i0}\left(z^t\right)} - 1$, yields the household's period-zero belief about real asset holdings at realization $\left(z^t, s_i^t\right)$:

$$\tilde{a}_{i0}\left(z^t, s_i^t\right) = (1 + \tilde{r}_{i0}(z^t))\tilde{a}_{i0}\left(z^{t-1}, s_i^{t-1}\right) + \tilde{y}_{i0}\left(z^t, s_i^t\right) - c\left(s_i^t\right). \tag{19}$$

Solving the last equation forward and using the fact that the household knows that it cannot run a Ponzi scheme along any path yields the household's period-zero formulation of the present value budget constraint:

$$(1 + \tilde{r}_{i0}(z^0))\tilde{a}_{i0}\left(z^{-1}, s_i^{-1}\right) = \sum_{t=0}^{\infty} \frac{1}{\prod_{k=1}^{t}(1 + \tilde{r}_{i0}(z^k))} \left[c\left(s_i^t\right) - \tilde{y}_{i0}\left(z^t, s_i^t\right)\right]. \tag{20}$$

This equation says that, along any path, the present value of consumption minus the present value of real non-interest income has to equal real liquid wealth at the beginning of period zero. Since the last equation holds along any path, it also has to hold in expectations across paths. Formally, taking expectations yields:

$$(1 + \tilde{r}_{i0}(z^0))\tilde{a}_{i0}\left(z^{-1}, s_i^{-1}\right) = \sum_{t=0}^{\infty} \sum_{z^t \in Z^t} \sum_{s_i^t \in S_i^t} p_{i0}\left(z^t, s_i^t\right) \frac{1}{\prod_{k=1}^{t}(1 + \tilde{r}_{i0}(z^k))} \left[c\left(s_i^t\right) - \tilde{y}_{i0}\left(z^t, s_i^t\right)\right]. \tag{21}$$

In the special case, where the household believes in perfect foresight about the future of the economy, the triple sum on the right-hand side of equation (21) reduces to a single sum, because $p_{i0}\left(z^t, s_i^t\right) = 1$ for one element of $Z^t \times S_i^t$ and $p_{i0}\left(z^t, s_i^t\right) = 0$ for all other elements of $Z^t \times S_i^t$. Expressing this equation in terms of log-deviations from a point, where all variables are constant over time and the gross real interest rate equals $1/\beta$ yields:

$$\frac{1}{\beta}\tilde{a}e^{\hat{r}_{i0}\left(z^0\right) + \hat{a}_{i0}\left(z^{-1}, s_i^{-1}\right)} = \sum_{t=0}^{\infty} \sum_{z^t \in Z^t} \sum_{s_i^t \in S_i^t} p_{i0}\left(z^t, s_i^t\right) \beta^t e^{-\sum_{k=1}^{t} \hat{r}_{i0}\left(z^k\right)} \left[ce^{\hat{c}\left(s_i^t\right)} - \tilde{y}e^{\hat{y}_{i0}\left(z^t, s_i^t\right)}\right], \tag{22}$$

with $\hat{c}\left(s_i^t\right) = \ln\left(c\left(s_i^t\right)/c\right)$, $\hat{y}_{i0}\left(z^t, s_i^t\right) = \ln\left(\tilde{y}_{i0}\left(z^t, s_i^t\right)/\tilde{y}\right)$, $\hat{r}_{i0}\left(z^k\right) = \ln\left(1 + \tilde{r}_{i0}\left(z^k\right)/1 + \tilde{r}\right)$, and $\hat{a}_{i0}\left(z^{-1}, s_i^{-1}\right) = \ln\left(\tilde{a}_{i0}\left(z^{-1}, s_i^{-1}\right)/\tilde{a}\right)$ for some (household-specific) c, $\tilde{y}$, and $\tilde{a}$. A first-order Taylor approximation of this equation at zero yields

$$\begin{aligned} &\tfrac{1}{\beta}\tilde{a}\left(\hat{r}_{i0}\left(z^0\right) + \hat{a}_{i0}\left(z^{-1}, s_i^{-1}\right)\right) \\ &= \textstyle\sum_{t=0}^{\infty} \sum_{z^t \in Z^t} \sum_{s_i^t \in S_i^t} p_{i0}\left(z^t, s_i^t\right) \beta^t \left[c\left(-\sum_{k=1}^{t} \hat{r}_{i0}\left(z^k\right) + \hat{c}\left(s_i^t\right)\right) - \tilde{y}\left(-\sum_{k=1}^{t} \hat{r}_{i0}\left(z^k\right) + \hat{y}_{i0}\left(z^t, s_i^t\right)\right)\right], \end{aligned} \tag{23}$$

which can also be written as

(24)
$$\hat{c}_{i0} + E_{i0}\left[\sum_{t=1}^{\infty}\beta^t\left(-\sum_{k=1}^{t}\hat{r}_k + \hat{c}_{it}\right)\right] = \frac{\frac{1}{\beta}\tilde{a}}{c}\left(\hat{r}_0 + \hat{a}_{i,-1}\right) + \frac{\tilde{y}}{c}E_{i0}\left[\hat{y}_{i0} + \sum_{t=1}^{\infty}\beta^t\left(-\sum_{k=1}^{t}\hat{r}_k + \hat{y}_{it}\right)\right].$$

This equation says that the expected present value of consumption has to equal real asset holdings at the start of the period plus the expected present value of real non-interest income.

Next, the standard consumption Euler equation and the law of iterated expectations at the individual level imply the following optimality condition, for all $t = 1, 2, \ldots$:

(25)
$$c\left(s_i^0\right)^{-\gamma} = \sum_{z^t \in Z^t}\sum_{s_i^t \in S_i^t} p_{i0}\left(z^t, s_i^t\right)\beta^t\left(\prod_{k=1}^{t}(1 + r_{i0}\left(z^k\right))\right)c\left(s_i^t\right)^{-\gamma}.$$

Expressing equation (25) in terms of log-deviations from a point, where all variables are constant over time and the gross real interest rate equals $1/\beta$ yields:

(26)
$$e^{-\gamma\hat{c}\left(s_i^0\right)} = \sum_{z^t \in Z^t}\sum_{s_i^t \in S_i^t} p_{i0}\left(z^t, s_i^t\right)e^{\sum_{k=1}^{t}\hat{r}_{i0}\left(z^k\right) - \gamma\hat{c}\left(s_i^t\right)}.$$

A first-order Taylor approximation of the last equation at zero yields

(27)
$$-\gamma\hat{c}\left(s_i^0\right) = \sum_{z^t \in Z^t}\sum_{s_i^t \in S_i^t} p_{i0}\left(z^t, s_i^t\right)\left[\sum_{k=1}^{t}\hat{r}_{i0}\left(z^k\right) - \gamma\hat{c}\left(s_i^t\right)\right],$$

which can also be written as

(28)
$$\hat{c}_{i0} = -\frac{1}{\gamma}E_{i0}\left[\sum_{k=1}^{t}\hat{r}_k\right] + E_{i0}\left[\hat{c}_{it}\right].$$

Finally, using equation (28) to substitute for $E_{i0}\left[\hat{c}_{it}\right]$ in equation (24) yields

(29)
$$\begin{aligned}\hat{c}_{i0} = \; & (1-\beta)\,\tfrac{\tilde{y}}{c}E_{i0}\left[\textstyle\sum_{t=0}^{\infty}\beta^t\hat{y}_{it}\right] \\ & -\left(\tfrac{1}{\gamma} - \tfrac{c-\tilde{y}}{c}\right)E_{i0}\left[\textstyle\sum_{t=1}^{\infty}\beta^t\hat{r}_t\right] \\ & +(1-\beta)\,\tfrac{\frac{1}{\beta}\tilde{a}}{c}\left(\hat{r}_0 + \hat{a}_{i,-1}\right)\end{aligned}.$$

We log-linearized equations (21) and (25) at a point, where all variables are constant over time, which requires the following relationship across variables in that point: $c = \tilde{y} + \left(\frac{1}{\beta} - 1\right)\tilde{a}$. One can use this equation to substitute for $c - \tilde{y}$ in the last equation.

B Computational implementation

This appendix describes the computational implementation of the model-based consumption responses reported in the paper. We build on the Sequence-Space Jacobian (SSJ) framework of Auclert et al. (2021) and the HANK model of Auclert et al. (2025), extending the toolkit

to compute individual-level Jacobians at each point in the household state space. We describe the model structure (Section B.1), the aggregate computation (Section B.2), the individual-level computation that is our main methodological contribution (Section B.3), and computational costs (Section B.4).

B.1 Model structure

Household block. The core of the computation is the heterogeneous-agent household block. Households have CRRA preferences with coefficient of relative risk aversion γ and discount factor β_i. They choose consumption c and savings in a single liquid asset a subject to a no-borrowing constraint $a \geq 0$. The state space consists of:

- *Assets*: $n_a = 200$ grid points on $[0, 4000]$, spaced exponentially to concentrate resolution at low wealth levels.
- *Income*: $n_e = 5$ income states from the Kaplan et al. (2018) combined income process, discretized on a Markov chain with transition matrix Π_e.
- *Discount factors*: A two-state Markov chain $\beta_i \in \{\beta_{\text{lo}}, \beta_{\text{hi}}\}$ with β_{hi} and $\beta_{\text{lo}} = \beta_{\text{hi}} - \Delta\beta$. The transition probability of a random reshuffle is $q = 0.01$ per quarter, with stationary mass ω on the high type.

The combined state space has $n_e \times 2 \times n_a = 10 \times 200 = 2{,}000$ points per period. The household block is solved by backward iteration over the Euler equation:

$$c(a, e, \beta) = \left[\beta(1+r)\,\mathbb{E}\left[c(a', e', \beta')^{-\gamma} \mid e, \beta\right]\right]^{-1/\gamma}, \tag{30}$$

with the savings policy determined by the budget constraint $a' = (1+r)a + y(e) - c$ and the borrowing constraint $a' \geq 0$. Endogenous gridpoint methods are used to solve for the policy functions. The steady-state distribution $D(a, e, \beta)$ is obtained by iterating forward on the policy functions until convergence.

Rest of the economy. The model follows Auclert et al. (2025) and consists of the following additional components:

- *Production*: Linear technology with output Y, pre-tax wage bill $wN = Y/\mu$ (where μ is a markup), and dividends $\text{div} = Y - wN$.
- *Bonds*: Real short-term bond pricing with ex-post return equal to the lagged ex-ante rate: $r_{\text{post}} = r_{\text{ante}}(-1)$.
- *Fiscal policy*: Government budget constraint $T = (1 + r_{\text{post}})B(-1) + G - B$, with proportional taxation determining after-tax wages $wN_{\text{aftertax}} = (1-\tau)wN$.
- *Equity pricing*: The dividend discount equation $p = (\text{div}(+1) + p(+1))/(1+r)$, solved by forward iteration.

- *Market clearing*: Asset market $A = p + B$ and goods market $C + G = Y$.

These components are combined with the household block into the model of Auclert et al. (2025). The SSJ framework automatically resolves the dependency structure across blocks and enables efficient Jacobian computation.

B.2 Aggregate computation

Steady state. The steady state of the model is computed by finding household parameters $(\beta_{\text{hi}}, \Delta\beta, \omega)$ such that aggregate asset demand $A = \int a\, dD(a, e, \beta)$ matches the target wealth-to-income ratio and the wealth Gini coefficient matches the data. This calibration is performed once and stored.

Jacobian computation. The SSJ framework computes the $T \times T$ Jacobian matrices of each block output with respect to each block input by a combination of forward and backward differentiation. For the household block, the key objects are:

$$\mathcal{J}^{C,r}_{t,s} = \frac{\partial C_t}{\partial r_s}, \qquad \mathcal{J}^{C,wN}_{t,s} = \frac{\partial C_t}{\partial (wN)_s}, \tag{31}$$

where $C_t = \int c_t(a, e, \beta)\, dD_t(a, e, \beta)$ is aggregate consumption. These are computed for a time horizon $T = 300$ quarters, yielding 300×300 matrices. The row $t = 0$ of each matrix gives the Jacobians $\mathcal{M}^r_s$ and $\mathcal{M}^Y_s$ used in equation (7).

Feeding in survey expectations. Given the aggregate Jacobians and the exogenous paths $\{dr^{\text{survey}}_s\}$ and $\{dY^{\text{survey}}_s\}$ constructed from survey data (see Section C), the aggregate consumption response is computed as:

1. Compute the future-expectations term $Z_0 = \sum_{s=1}^{T-1} \left(\mathcal{M}^r_s \cdot dr_s + \mathcal{M}^Y_s \cdot dY_s\right)$.
2. Solve for the period-zero outcome $dY_0 = (\mathcal{M}^r_0 \cdot dr_0 + Z_0)/(1 - \mathcal{M}^Y_0)$ via goods market clearing.
3. Decompose $dC_0 = dY_0$ into interest rate and income channels using the respective Jacobian contributions.

More precisely, the period-zero equilibrium is a 2×2 linear system in $(dY_0, d\pi_0)$, where the two equations are the goods market clearing condition and the New Keynesian Phillips curve. The full model Jacobians—obtained by composing household block Jacobians with the non-household blocks—determine the 2×2 coefficient matrix and the right-hand side that encodes the effects of all future exogenous paths.

B.3 Individual-level Jacobians and the covariance decomposition

A key contribution of this paper is computing consumption responses at the *individual* level, using each survey respondent's own expectations together with Jacobians interpolated to her

position in the income–wealth distribution. This requires going beyond the aggregate Jacobians provided by the standard SSJ toolkit.

Gridpoint Jacobians. For a subgrid of income–asset positions, we compute the Jacobian of consumption *at that specific gridpoint* with respect to aggregate inputs. Concretely, for each sampled gridpoint (e_j, a_k), we define an indicator output:

$$C_{j,k} = \sum_{(e,a)} c(e,a) \cdot \mathbf{1}_{(e,a)=(e_j,a_k)} \cdot D(e,a), \tag{32}$$

which isolates the contribution of that single gridpoint to aggregate consumption. The SSJ framework treats $C_{j,k}$ as an additional aggregate output of the household block and computes its Jacobian with respect to inputs (r, wN) using the same differentiation as for aggregate consumption. Dividing by the steady-state mass $D(e_j, a_k)$ yields the per-capita Jacobian:

$$m_s^r(e_j,a_k) = \frac{1}{D(e_j,a_k)} \frac{\partial C_{j,k,0}}{\partial r_s}, \qquad m_s^Y(e_j,a_k) = \frac{1}{D(e_j,a_k)} \frac{\partial C_{j,k,0}}{\partial (wN)_s}. \tag{33}$$

These are the individual Jacobians for a household located at state (e_j, a_k): they describe how that household's consumption at $t = 0$ responds to a change in the interest rate or income at date s.

Grid sampling. Computing Jacobians for all 2,000 gridpoints would require 2,000 additional output evaluations, which is computationally expensive. We instead sample a subgrid of $n_e^{\text{sample}} \times n_a^{\text{sample}} = 10 \times 50 = 500$ points, with the asset subgrid spaced to provide finer resolution at low wealth levels where the Jacobians vary most rapidly. For each of the 500 sampled gridpoints and each of the two inputs (r, wN), the framework computes a $1 \times T$ Jacobian vector—the response of $C_{j,k,0}$ to a shock at each date $s = 0, \ldots, T-1$. The total number of Jacobian vectors is thus $500 \times 2 = 1{,}000$, each of length $T = 300$.

Interpolation to individual positions. Each survey respondent i is mapped to a position (e_i, a_i) in the model state space using her percentile rank in the income and wealth distributions. We use bilinear interpolation on the sampled subgrid to obtain respondent-specific Jacobians $m_{s,i}^r$ and $m_{s,i}^Y$ for each horizon s. For each horizon $s \in \{0, \ldots, T-1\}$, we construct an interpolation surface over the (e, a) subgrid. Each respondent's Jacobian profile is then obtained by evaluating the interpolator at her position, at negligible computational cost.

Individual consumption responses. Respondent i's consumption response is then:

$$dc_{i,0} = \underbrace{\sum_{s=0}^{T-1} m_{s,i}^r \cdot dr_{s,i}^{\text{survey}}}_{\text{interest rate channel}} + \underbrace{\sum_{s=0}^{T-1} m_{s,i}^Y \cdot dY_{s,i}^{\text{survey}}}_{\text{income channel}}, \tag{34}$$

where $dr_{s,i}^{\text{survey}}$ and $dY_{s,i}^{\text{survey}}$ are respondent i's own expectation paths interpolated to quarterly frequency as described in Section C. This computation is a simple dot product for each respondent and each channel, applied to the $\sim$700 survey respondents per wave.

Covariance decomposition. Given the individual responses, the decomposition in equation (13) is computed as:

$$\text{(35)} \qquad \text{(A) Avg} \times \text{Avg:} \quad \bar{\mathcal{M}}^r \cdot \overline{dr}^{\text{survey}} + \bar{\mathcal{M}}^Y \cdot \overline{dY}^{\text{survey}},$$

$$\text{(36)} \qquad \text{(B) Individual mean:} \quad \frac{1}{N}\sum_{i=1}^{N} dc_{i,0},$$

$$\text{(37)} \qquad \text{(B}-\text{A) Covariance:} \quad \text{(B)} - \text{(A)},$$

where all dot products are over the $T = 300$ quarters. Row (A) uses the aggregate Jacobians from the standard SSJ computation and the cross-sectional average of individual expectation paths. Row (B) uses the individual Jacobians interpolated to each respondent's position and applied to her own expectations. The difference isolates the covariance between Jacobians and expectations across individuals.

B.4 Computational costs

Table A.1 summarizes the computational costs of the main steps, measured on a standard desktop computer.

Table A.1: Computational costs

Step	Time	Description
Steady state calibration	$\sim$30 sec	Root-finding over $(\beta_{\text{hi}}, \Delta\beta, \omega)$
Aggregate Jacobians	$\sim$2 min	$\mathcal{J}^{C,r}$ and $\mathcal{J}^{C,wN}$ for $T = 300$
GE scenario solving	$<$ 1 sec	2×2 linear system per scenario
Gridpoint Jacobians (500 outputs)	$\sim$60 min	500 gridpoint outputs, differentiated individually
Interpolation & individual responses	$\sim$10 sec	Bilinear interpolation for $\sim$700 respondents
Covariance decomposition	$<$ 1 sec	Dot products of precomputed objects

Notes: Approximate wall-clock time on a single core of an Apple M-series processor. The gridpoint Jacobian computation is the dominant cost and scales linearly in the number of sampled gridpoints. All other steps are fast relative to this bottleneck.

The aggregate computation—steady state, aggregate Jacobians, and GE scenario solving—takes approximately 2–3 minutes per calibration and produces the results in Table 2. This is the standard SSJ workflow of Auclert et al. (2021).

The individual-level computation is our methodological extension and accounts for the bulk of the computational cost. The bottleneck is the gridpoint Jacobian step: for each of the 500 sampled gridpoints, the framework must perform a full differentiation through the household block, with state space of dimension 2,000 and time horizon $T = 300$. The cost scales linearly in the number of sampled gridpoints. Reducing from 500 to 100 gridpoints would reduce computation time proportionally, at the expense of interpolation accuracy for respondents at unusual positions in the wealth distribution.

Once the gridpoint Jacobians are computed, all subsequent steps—interpolation, individual response calculation, and the covariance decomposition—are near-instantaneous. The gridpoint

Jacobians need to be computed only once per calibration and can be reused across all survey waves and robustness exercises.

C Expectations across policies: Deriving model inputs from survey responses

The survey elicits each household's expected path for the federal funds rate, the inflation rate, and own income under the baseline policy announcement and under the alternative policy announcement. In this appendix, we explain how we derive the model inputs from the survey responses. For ease of exposition, we focus on one survey wave (March 2021). This allows us to use specific years in the indices, which improves readability of the equations in this appendix.

Let $E_{it}[r_s]$ denote household i's expectation in period t of the federal funds rate in period s. Let $\Delta E_{it}[r_s] = E^a_{it}[r_s] - E^b_{it}[r_s]$ denote the difference between the expectation under the alternative policy announcement and the expectation under the baseline policy announcement. The survey elicits each household's expectation in quarter t=2021:Q1 of the federal funds rate at the end of five years (2021, 2022, 2023, 2026, and 2030) under the two policy announcements.[1] Hence, from the survey, one can directly compute $\Delta E_{it}[r_{2021:Q4}]$, $\Delta E_{i,t}[r_{2022:Q4}]$, $\Delta E_{it}[r_{2023:Q4}]$, $\Delta E_{it}[r_{2026:Q4}]$, and $\Delta E_{it}[r_{2030:Q4}]$. We interpolate the answers for those quarters s that we do not ask about with the following formula:

$$\Delta E_{it}[r_s] = \begin{cases} \Delta r_{2021:Q1} & s = t, t+1, t+2 \\ \Delta E_{it}[r_{2021:Q4}] & s = t+3, \ldots, t+6 \\ \Delta E_{it}[r_{2022:Q4}] & s = t+7, \ldots, t+10 \\ \Delta E_{it}[r_{2023:Q4}] & s = t+11, \ldots, t+22 \\ \Delta E_{it}[r_{2026:Q4}] & s = t+23, \ldots, t+38 \\ (1-\delta)^{s-(t+39)} \Delta E_{it}[r_{2030:Q4}] & s \geq t+39 \end{cases}. \tag{38}$$

This formula contains two assumptions. First, the difference in the expectation under the two policy announcements starts in the quarter for which it is expressed for the first time. Second, the effect of the announcement in 2021:Q1 on the expected federal funds rate in quarter s converges to zero at rate δ from quarter 2030:Q4 onwards.

Turning to inflation, let $E_{it}[\pi_s]$ denote household i's expectation in period t of the inflation rate in period s. Let $\Delta E_{it}[\pi_s] = E^a_{it}[\pi_s] - E^b_{it}[\pi_s]$ denote the difference between the expectation under the alternative policy announcement and the expectation under the baseline policy announcement. The survey elicits each household's expectation in quarter t=2021:Q1 of the annual inflation rate over the year 2021, over the year 2022, over the year 2023, and over the period 2024-2026. We compute the expected quarterly inflation rates with the following

[1] The survey elicits an annualized rate. We turn this annualized rate into a rate for a quarter by dividing it by four.

formula:

$$\Delta E_{it}\left[\pi_s\right] = \begin{cases} \frac{1}{3}\Delta E_{it}\left[\pi_{2021}\right] & s = t+1,\ldots,t+3 \\ \frac{1}{4}\Delta E_{it}\left[\pi_{2022}\right] & s = t+4,\ldots,t+7 \\ \frac{1}{4}\Delta E_{it}\left[\pi_{2023}\right] & s = t+8,\ldots,t+11 \\ \frac{1}{4}\Delta E_{it}\left[\bar{\pi}_{2024-2026}\right] & s = t+12,\ldots,t+23 \\ (1-\delta)^{s-(t+23)}\frac{1}{4}\Delta E_{it}\left[\bar{\pi}_{2024-2026}\right] & s \geq t+24 \end{cases} . \tag{39}$$

This formula contains two assumptions. First, the household expects the price level to grow at a constant rate within a year and within the period 2024-2026 following the policy announcement. The expected quarterly inflation rate thus equals (1/3) times the expected annual inflation rate in 2021 and (1/4) times the expected annual inflation rate in the following years. Second, the effect of the policy announcement in quarter t=2021:Q1 on the expected inflation rate in quarter s converges to zero at rate δ from quarter 2026:Q4 onwards.

Turning to own nominal income, let $E_{it}\left[y^g_{is}\right] = E_{it}\left[\frac{y_{is}-y_{i,t-1}}{y_{i,t-1}}\right]$ denote household i's expectation in period t of the percentage difference between nominal income in period s and nominal income in period $t-1$. Assuming that households know their own past nominal income, we have $E_{it}\left[y^g_{is}\right] = \frac{E_{it}[y_{is}]-y_{i,t-1}}{y_{i,t-1}}$. Let $\Delta E_{it}\left[y^g_{is}\right] = E^a_{it}\left[y^g_{is}\right] - E^b_{it}\left[y^g_{is}\right]$ denote the difference between the expectation under the alternative policy announcement and the expectation under the baseline policy announcement. The survey elicits each household's expectation in quarter t=2021:Q1 of own nominal income in the year 2021, average own nominal income in the years 2022-2023, and average own nominal income in the years 2024-2026 under the two policy announcements. Hence, from the survey, one can directly compute $\Delta E_{it}\left[y^g_{i,2021}\right] = \frac{\Delta E_{it}[y_{i,2021}]}{y_{i,2020}}$, $\Delta E_{it}\left[\bar{y}^g_{i,2022-2023}\right] = \frac{\Delta E_{it}[\bar{y}_{i,2022-2023}]}{y_{i,2020}}$, and $\Delta E_{it}\left[\bar{y}^g_{i,2024-2026}\right] = \frac{\Delta E_{it}[\bar{y}_{i,2024-2026}]}{y_{i,2020}}$. To arrive at expectations of quarterly own nominal income, we use the following formula:

$$\Delta E_{it}\left[y^g_{is}\right] = \begin{cases} \Delta E_{it}\left[y^g_{i,2021}\right] & s = t,\ldots,t+3 \\ \Delta E_{it}\left[\bar{y}^g_{i,2022-2023}\right] & s = t+4,\ldots,t+11 \\ \Delta E_{it}\left[\bar{y}^g_{i,2024-2026}\right] & s = t+12,\ldots,t+23 \\ (1-\delta)^{s-(t+23)}\Delta E_{it}\left[\bar{y}^g_{i,2024-2026}\right] & s \geq t+24 \end{cases} . \tag{40}$$

This formula contains two assumptions. First, if the household expects *annual* nominal income in 2021 to be x% higher in the year 2021 than in the year 2020, then the household expects *quarterly* nominal income to be x% higher in each quarter of the year. Second, the effect of the policy announcement in quarter t=2021:Q1 on the expected own nominal income in quarter s converges to zero at rate δ from quarter 2026:Q4 onwards.

Finally, the expectation of own real income is determined by the expectation of own nominal income and the expectation of the rate of inflation

$$E_{it}\left[\hat{y}_{is}\right] = E_{it}\left[y^g_{is}\right] - \sum_{k=t}^{s} E_{it}\left[\pi_k\right],$$

where $E_{it}[\hat{y}_{is}]$ is the expectation of household i in period t=2021:Q1 of the percentage difference between own real income in quarter s and own real income per quarter in 2020. The last equation implies

$$\Delta E_{it}[\hat{y}_{is}] = \Delta E_{it}\left[y^g_{is}\right] - \sum_{k=t}^{s} \Delta E_{it}[\pi_k], \tag{41}$$

where $\Delta E_{it}[\hat{y}_{is}]$ is the difference between the real income expectation under the alternative policy announcement and the real income expectation under the baseline policy announcement.

Robustness checks using alternative values of δ yield nearly identical results. Robustness checks varying how calendar-year expectations are distributed across quarters of a year also yield very similar results, because Jacobians locally do not vary strongly with s for most s.

D Additional details on the data and empirical results

D.1 Summary statistics

Table A.2 displays summary statistics for each of our five surveys, along with population benchmarks from the American Community Survey (ACS).

D.2 Attention to Fed announcements

In some of our exercises, we assume that only a fraction of households are attentive to the monetary policy announcements. We therefore also measure our survey respondents' attention to monetary policy.

Designing attention measures that have an informative "level" interpretation—i.e., that can be used to identify a group of attentive agents within a cross-section of respondents—is challenging. We therefore include various different elicitations in our March 2022 survey. The concrete instructions can be found in Appendix G.2. Table A.3 shows the fractions of households classified as attentive according to each of these measures as well as the pairwise correlation coefficients between the different measures. Three of our measures are based on direct elicitation of respondents' degree of attention. 38 percent, 57 percent and 41 percent indicate to hear about Fed announcements like the ones in our scenarios within at most one week, to have heard Fed news at least once in the preceding month, and to typically hear Fed news at least monthly, respectively. On top of this, we include two questions testing respondents' factual knowledge about the Fed. 18 percent of the respondents correctly respond to a question asking them to identify the one or more than one true news item(s) out of a set of four items, while 31 percent select the correct date for the most recent change of the federal funds target rate out of a list of five dates. Although the different measures are mostly positively correlated with each other, the overlap is not perfect. This underscores the need to develop better elicitation methods for attention to the economy and to policies.

Table A.2: Summary statistics

	ACS 2019	Online Sample					
	(1) Mean	(2) Mean	(3) Median	(4) SD	(5) p25	(6) p75	(7) Observations
Panel A: March 2021 survey							
Female	0.51	0.50	1.00	0.50	0.00	1.00	1,871
Age	47.78	52.49	60.00	15.20	40.00	70.00	1,871
At least bachelor's degree	0.31	0.41	0.00	0.49	0.00	1.00	1,871
Log(Household net income)	11.06	11.06	11.13	0.81	10.54	11.65	1,871
Northeast	0.17	0.19	0.00	0.40	0.00	0.00	1,871
Midwest	0.21	0.28	0.00	0.45	0.00	1.00	1,871
South	0.38	0.31	0.00	0.46	0.00	1.00	1,871
West	0.24	0.22	0.00	0.41	0.00	0.00	1,871
Panel B: March 2022 survey							
Female	0.51	0.53	1.00	0.50	0.00	1.00	692
Age	47.78	38.54	40.00	13.86	30.00	50.00	692
At least bachelor's degree	0.31	0.31	0.00	0.46	0.00	1.00	692
Log(Household net income)	11.06	10.78	10.82	0.81	10.31	11.35	692
Northeast	0.17	0.20	0.00	0.40	0.00	0.00	692
Midwest	0.21	0.19	0.00	0.39	0.00	0.00	692
South	0.38	0.40	0.00	0.49	0.00	1.00	692
West	0.24	0.21	0.00	0.41	0.00	0.00	692
Panel C: September 2022 survey							
Female	0.51	0.51	1.00	0.50	0.00	1.00	1,106
Age	47.78	39.12	40.00	13.79	30.00	50.00	1,106
At least bachelor's degree	0.31	0.47	0.00	0.50	0.00	1.00	1,106
Log(Household net income)	11.06	10.90	10.98	0.78	10.43	11.38	1,106
Northeast	0.17	0.19	0.00	0.39	0.00	0.00	1,106
Midwest	0.21	0.20	0.00	0.40	0.00	0.00	1,106
South	0.38	0.43	0.00	0.50	0.00	1.00	1,106
West	0.24	0.18	0.00	0.38	0.00	0.00	1,106
Panel D: September 2025 survey							
Female	0.51	0.52	1.00	0.50	0.00	1.00	902
Age	47.78	46.20	50.00	13.46	40.00	60.00	902
At least bachelor's degree	0.31	0.46	0.00	0.50	0.00	1.00	902
Log(Household net income)	11.06	11.02	11.08	0.75	10.60	11.51	902
Northeast	0.17	0.16	0.00	0.37	0.00	0.00	902
Midwest	0.21	0.20	0.00	0.40	0.00	0.00	902
South	0.38	0.44	0.00	0.50	0.00	1.00	902
West	0.24	0.20	0.00	0.40	0.00	0.00	902
Panel E: Additional survey (March 2021)							
Female	0.51	0.52	1.00	0.50	0.00	1.00	392
Age	47.78	51.60	50.00	15.79	40.00	70.00	392
At least bachelor's degree	0.31	0.31	0.00	0.47	0.00	1.00	392
Log(Household net income)	11.06	10.77	10.97	1.41	10.37	11.51	392
Northeast	0.17	0.20	0.00	0.40	0.00	0.00	392
Midwest	0.21	0.20	0.00	0.40	0.00	0.00	392
South	0.38	0.40	0.00	0.49	0.00	1.00	392
West	0.24	0.20	0.00	0.40	0.00	0.00	392

Notes: This table shows summary statistics for the March 2021 survey (Panel A), the March 2022 survey (Panel B), the September 2022 survey (Panel C), the September 2025 survey (Panel D), and the additional survey conducted in March 2021 (Panel E).

In our implementation, we mostly rely on a classification based on the first measure, classifying those as attentive who report that it would take at most a week until they hear

Table A.3: Various measures of attention to monetary policy: March 2022 survey

	Hears Fed news within a week	Heard Fed news at least once last month	Typically hears Fed news at least monthly	Fed news quiz correct	Date last rate change correct
	(1)	(2)	(3)	(4)	(5)
Hears Fed news within a week	1.0000				
Heard Fed news at least once last month	0.3400	1.0000			
Typically hears Fed news at least monthly	0.3260	0.5640	1.0000		
Fed news quiz correct	0.1840	0.0740	0.0220	1.0000	
Date last rate change correct	-0.0180	0.0410	0.0250	0.0770	1.0000
Mean dep. variable	0.38	0.57	0.41	0.18	0.31
Observations	692	692	692	692	692

Notes: This table presents pairwise correlation coefficients and sample means of several alternative measures of attention to monetary policy: dummy variables indicating whether a respondent reports to typically hear about Fed announcements within a week or less (Column 1), whether the respondent heard news about the Fed at least once within the last month (Column 2), whether the respondent typically hears news about the Fed at least once per month (Column 3), whether the respondent responded correctly to a question asking them to identify the true news item(s) out of a set of true and false news about the Fed (Column 4), or whether the respondent correctly identified the date of the last change of the fed funds target rate (Column 5). The sample is the full sample of our March 2022 survey.

about announcements like the ones in our scenarios.

D.3 Outliers in survey expectations

As explained in Section 3.3, we exclude outliers in household expectations, which may reflect inattention to our survey and which might otherwise exert a disproportionate influence on our model's predictions.

Specifically, we exclude responses predicting a federal funds rate higher than 20 percent for any horizon (corresponding to the 98th or 99th percentile in the March 2021 survey depending on the horizon), responses predicting an inflation rate higher than 20 percent for any horizon (98th or 99th percentile), and responses predicting cumulative income growth of less than -70 percent or higher than 200 percent for any horizon (first and 98th or 99th percentile). In addition, we set to missing those who predict extreme differences in beliefs across the two hypothetical scenarios, as such extreme differences likely indicate typos. Specifically, we set to missing those predicting absolute effects on the federal funds rate and on the inflation rate of more than 5 percentage points or absolute effects on cumulative income growth of more than 50 percentage points. Again, these cutoffs mostly correspond to the bottom first or second or top 98th or 99th percentiles across variables and horizons.

Even though these steps are not restrictive individually, and even though there is a strong respondent fixed effect in the tendency to report extreme forecasts for different variables, the overall procedure results in the exclusion of 13.6 percent, 17.4 percent, 13.7 percent, and 11.4 percent of responses in the March 2021, the March 2022, the September 2022, and the September 2025 survey, respectively. Our results are not sensitive to the exact exclusion criteria.

D.4 Measured expectations: Extensions

We present two extensions of our empirical exercises, which highlight how our approach can be flexibly tailored to feature particular policy announcements and specific expectation outcomes.

Varying the source of the change in projections Our March 2021 survey presents respondents with a hypothetical increase in the Fed's projection of the federal funds rate at the end of 2023 from 0.1 to 0.5 percent. Our respondents are randomized into four conditions: in the "no-reason" group, respondents are not provided with a reason for why the projection changes; in the "endogenous" group, respondents are told that the change in the projection is due to a change in the Fed's outlook on the broader development of the economy; in the "exogenous" group, participants are told that the change in the Fed's projection occurred because the composition of the committee changed before the meeting and is not due to a change in the Fed's outlook on the broader development of the economy; in the "exogenous-stock" group, respondents receive the same instructions as respondents in the "exogenous" group, but are additionally told that, in response to the Fed announcement, the S&P 500 stock market index falls by one percent. The exact instructions can be found in Appendix G.1. As shown in Table A.4, the measured expectation differences remain similar when varying the source of the shock, with the largest differences across arms for adjustments in nominal income expectations. In our main exercise, we pool all four arms.

Expectations about credit constraints and home prices Monetary policy announcements may shift households' expectations about becoming credit constrained or about future home prices. While our model abstracts from such channels, it is straightforward to adjust our survey design to capture such effects.

We illustrate this using an additional survey (n=392) conducted in collaboration with Luc.id in March 2021. As in our main survey from March 2021, the respondents are confronted with a no-change baseline scenario and a scenario where the projected federal funds rate at the end of 2023 increases from 0.1 to 0.5 percent. However, we elicit expectations about a different set of variables: the future federal funds rate, the probability that the household will be borrowing constrained in the future, and the value of the household's main residence. In Appendix G.5, we provide the full experimental instructions. Table A.2 Panel E displays summary statistics.[2]

The first row of Table A.5 shows similar effects on expectations about the federal funds rate in the additional survey as in the main survey. The second and the third row show that respondents' subjective probability of becoming credit constrained weakly increases and their home price expectations moderately increase in response to the change in the Fed's projection, although these effects do not reach statistical significance.

[2]We apply the same sample restrictions as in the main survey to our initial sample of 478 respondents in the robustness survey. This results in dropping 8 respondents in the top and bottom percentiles of response time, and dropping 78 respondents providing outlier responses. We define outliers according to respondents' predicted federal funds rate as in the main survey (described in Appendix D.3), and according to predicted home price growth (less than -90 or greater than 900 percent, or an absolute difference in expected home price growth across scenarios of more than 150 percent).

Table A.4: Expectation differences across unconventional monetary policy scenarios by reason for the policy change: March 2021 survey

	Horizon				
	(1) 2021	(2) 2022	(3) 2023	(4) 2026	(5) 2030
Panel A: Change no explanation					
Δ Expected federal funds rate	0.031	0.021	0.150***	0.049	0.025
	(0.022)	(0.027)	(0.032)	(0.039)	(0.045)
Δ Expected inflation rate	-0.350***	-0.290***	-0.166***	-0.230***	
	(0.046)	(0.051)	(0.062)	(0.072)	
Δ Expected cumulative income growth	-0.988***		-0.555*	-0.674*	
	(0.284)		(0.322)	(0.368)	
Observations	446	446	446	446	446
Panel B: Change endogenous					
Δ Expected federal funds rate	0.053**	0.089***	0.175***	0.059	0.015
	(0.022)	(0.023)	(0.028)	(0.039)	(0.045)
Δ Expected inflation rate	-0.221***	-0.171***	-0.096	-0.196***	
	(0.040)	(0.048)	(0.065)	(0.069)	
Δ Expected cumulative income growth	0.063		0.187	-0.264	
	(0.271)		(0.338)	(0.399)	
Observations	493	493	493	493	493
Panel C: Change exogenous					
Δ Expected federal funds rate	0.068***	0.079***	0.227***	0.118***	0.111**
	(0.021)	(0.026)	(0.037)	(0.045)	(0.052)
Δ Expected inflation rate	-0.278***	-0.212***	-0.100	-0.244***	
	(0.042)	(0.053)	(0.066)	(0.073)	
Δ Expected cumulative income growth	0.316		0.386	0.001	
	(0.306)		(0.290)	(0.326)	
Observations	439	439	439	439	439
Panel D: Change exogenous stocks					
Δ Expected federal funds rate	0.071***	0.075***	0.184***	-0.028	-0.100*
	(0.025)	(0.028)	(0.038)	(0.047)	(0.055)
Δ Expected inflation rate	-0.246***	-0.205***	-0.026	-0.156**	
	(0.046)	(0.049)	(0.059)	(0.065)	
Δ Expected cumulative income growth	-0.173		-0.453	-0.577*	
	(0.300)		(0.341)	(0.343)	
Observations	493	493	493	493	493

Notes: This table shows the effect of the hypothetical increase in the Fed's projection of the future federal funds rate at the end of 2023 from 0.1 to 0.5 percent in March 2021 on respondents' own expectations about the federal funds rate, inflation and the cumulative growth of nominal household net income at different horizons, across the four survey arms providing respondents with different reasons for the change in the Fed's projections. Arm "Change no explanation" (Panel A) does not give an explanation for the change in projections. Arm "Change endogenous" (Panel B) attributes the change in the Fed's projections to a change in the Fed's broader economic outlook. Arm "Change exogenous" (Panel C) attributes the change in the Fed's projections to a change in the composition of the Fed's committee before the next meeting. Arm "Change exogenous stocks" (Panel D) features the same explanation as "Change exogenous" and in addition explains that the stock market drops by one percent in response to the Fed's projections. Robust standard errors are in parentheses. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

Table A.5: Expectation differences across unconventional monetary policy scenarios: Additional survey (March 2021)

	Horizon				
	(1) 2021	(2) 2022	(3) 2023	(4) 2026	(5) 2030
Δ Expected federal funds rate	0.040	0.052*	0.147***	0.007	-0.048
	(0.026)	(0.029)	(0.035)	(0.044)	(0.052)
Δ Subjective probability credit constrained	0.312	0.093		0.396	
	(0.618)	(0.697)		(0.786)	
Δ Expected cumulative home value growth			0.915		
			(0.989)		
Observations	392	392	392	392	392

Notes: This table shows the effect of the hypothetical increase in the Fed's projection of the future federal funds rate at the end of 2023 from 0.1 to 0.5 percent in March 2021 on respondents' own expectations about the federal funds rate, the probability of becoming credit constrained, and the cumulative growth of the nominal value of their main residence at different horizons. Robust standard errors are in parentheses. * denotes significance at 10 pct., ** at 5 pct., and *** at 1 pct. level.

D.5 Attentive households and aggregate consumption responses

In this robustness exercise, we revisit Table 2 under the assumption that inattentive households do not adjust expectations in response to the announcement. Concretely, for each survey wave we classify respondents as attentive if they report that they typically learn about Fed announcements within seven days. We then set all expectation differences to zero for the remaining respondents and recompute the aggregate response using the same model Jacobians and aggregation procedure as in the baseline.

Relative to the baseline rows, attentive-only responses are uniformly smaller in absolute value: from $+0.27$ to $+0.05$ in March 2021, from -0.56 to -0.24 in March 2022, from -0.96 to -0.47 in September 2022, and from $+0.08$ to $+0.02$ in September 2025. The qualitative pattern is unchanged: the sign and the dominant channel in each wave remain the same, but inattention dampens the aggregate effect.

E Robustness to alternative calibrations

This appendix reports the main quantitative results under two alternative calibrations of the heterogeneous-agent model, in addition to the baseline calibration with $\gamma = 3$ and discount factor parameters chosen to match the U.S. wealth distribution. The two alternatives are:

1. **Auclert et al. calibration** ($\gamma = 1$, EIS $= 1$): the original calibration of Auclert et al. (2025), with log utility over consumption and their discount factor distribution (average $\bar{\beta} \approx 0.95$, targeting wealth-to-income of 5 and a Gini coefficient of 0.85).

2. $\gamma = 3$ **with Auclert et al. discount factors**: our baseline risk aversion ($\gamma = 3$, EIS $= 1/3$)

Table A.6: Model-based consumption responses across survey waves: attentive-household exercise

		Total dC_0	Interest rate	Income
Panel A: March 2021 (Forward Guidance)	All households	+0.27	+0.07	+0.20
	Attentive only	+0.05	+0.02	+0.03
Panel B: March 2022 (Rate Hike)	All households	−0.56	+0.00	−0.56
	Attentive only	−0.24	+0.01	−0.25
Panel C: Sep 2022 (Rate Hike)	All households	−0.96	+0.22	−1.18
	Attentive only	−0.47	+0.10	−0.57
Panel D: Sep 2025 (Rate Cut)	All households	+0.08	−0.00	+0.08
	Attentive only	+0.02	−0.01	+0.04

Notes: This table replicates Table 2. "All households" reproduces the baseline decomposition. "Attentive only" sets expectation differences to zero for respondents who report that they typically learn about Fed announcements only after seven days (or never), before aggregation. Baseline results exclude the valuation channel. Attentive shares are 54.2 percent (March 2021), 38.2 (March 2022), 50.0 percent (September 2022), and 55.3 percent (September 2025).

but *without* recalibrating the discount factor distribution, retaining the discount factors from the Auclert et al. calibration.

The key difference between the baseline and these alternatives lies in the elasticity of intertemporal substitution and the implied wealth distribution. The Auclert et al. calibration features EIS $= 1$ (stronger intertemporal substitution). Calibration (2) isolates the effect of changing risk aversion without adjusting the discount factor distribution, i.e. households hold more savings relative to our baseline. The survey expectation data are identical across all calibrations.

E.1 Aggregate consumption responses

Table A.7 reports the aggregate consumption response under each calibration.

Table A.7: Model-based consumption responses: alternative calibrations

	Baseline ($\gamma=3$, recalib.)			Auclert et al. ($\gamma=1$)			$\gamma=3$, Auclert β		
Panel	Total	Rate	Inc.	Total	Rate	Inc.	Total	Rate	Inc.
A: Mar 2021	+0.27	+0.07	+0.20	−0.17	−0.29	+0.12	+0.44	+0.16	+0.28
B: Mar 2022	−0.56	0.00	−0.56	−0.54	+0.01	−0.56	−0.65	0.00	−0.65
C: Sep 2022	−0.96	+0.22	−1.18	−2.07	−0.67	−1.40	−0.75	+0.45	−1.20
D: Sep 2025	+0.08	0.00	+0.08	+0.14	+0.05	+0.09	+0.06	−0.01	+0.07

Notes: All entries in percent of steady-state consumption. "Total" is the consumption response dC_0 excluding the valuation channel. "Rate" combines the current and future real interest rate channels. "Inc." is the income channel. The baseline calibration uses $\gamma = 3$ with recalibrated discount factors (as in Table 2). Auclert et al. uses $\gamma = 1$ with their original discount factors. The third column uses $\gamma = 3$ with the Auclert et al. discount factors (no recalibration). Survey expectations are identical across calibrations.

Several patterns emerge. First, the income channel is broadly similar across calibrations for the March 2022 and September 2025 surveys, where measured inflation expectations respond

to the policy announcement. This is because the income channel operates primarily through the marginal propensity to consume out of income, which is less sensitive to the EIS.

Second, the interest rate channel differs substantially across calibrations. Under $\gamma = 1$ (EIS $= 1$), the substitution effect of interest rate changes is stronger and can dominate the income effect, causing the rate channel to switch sign relative to the baseline. For the September 2022 rate hike, the rate channel contribution changes from $+0.22$ (baseline) to -0.67 (Auclert et al.), because with a high EIS the intertemporal substitution motive to reduce current consumption dominates the wealth effect on savers. Conversely, the $\gamma = 3$ calibration with Auclert discount factors produces a rate channel of $+0.45$, because the low EIS amplifies the income-from-savings effect.

Third, the total consumption response for September 2022 (Panel C) is largest under the Auclert et al. calibration (-2.07 percent) and smallest under $\gamma = 3$ with Auclert betas (-0.75 percent), with the baseline in between (-0.96 percent). This ordering reflects the compounding of a larger income channel and a negatively signed rate channel under high EIS.

E.2 Validation: model-based vs. self-reported responses

Table A.8 reports regression coefficients relating the model-implied individual consumption response to the self-reported indicator of fewer purchases (Section 4.5). A negative and significant coefficient indicates that respondents whose model-predicted consumption decline is larger are also more likely to self-report reducing their spending.

Table A.8: Validation regression coefficients: alternative calibrations

	Baseline ($\gamma=3$, recalib.)	Auclert et al. ($\gamma=1$)	$\gamma=3$, Auclert β
Total	-0.308^{***}	-0.110	-0.484^{***}
	(0.102)	(0.102)	(0.125)
Rate channel	-0.468^{**}	$+0.362^{**}$	-0.588^{**}
	(0.237)	(0.148)	(0.240)
Income channel	-0.382^{***}	-0.293^{***}	-0.698^{***}
	(0.134)	(0.104)	(0.184)

Notes: Each cell reports the OLS coefficient from regressing a dummy variable (multiplied by 100) indicating whether the respondent reports fewer non-durable purchases in the rate increase scenario on the model-based consumption response (%). Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. September 2022 survey, $N = 1{,}106$.

The income channel coefficient is negative and highly significant across all three calibrations, confirming that the income-driven cross-sectional variation in model-implied consumption responses aligns with self-reported behavior regardless of the EIS assumption. For the total response, the baseline and the $\gamma = 3$ with Auclert betas calibration produce strongly significant negative coefficients (-0.31 and -0.48), while the Auclert et al. calibration yields a smaller and insignificant coefficient (-0.11). The weaker total-response validation under $\gamma = 1$ reflects the rate channel: with a high EIS, the rate channel Jacobians generate cross-sectional variation that is positively correlated with self-reported fewer purchases (coefficient $+0.36$, significant),

working against the income channel. In contrast, both $\gamma = 3$ calibrations produce negative rate-channel coefficients, so that the rate and income channels reinforce each other in the validation exercise. This pattern suggests that a lower EIS—as in our baseline—produces model-implied individual responses that better match self-reported consumption plans.

F Consumption dynamics with learning

The expectations are updated as follows. Let us start with the updating of inflation expectations. Define for all $s \geq 1$

$$\pi^{belief}_{s|0} = \pi^{survey}_{s}. \tag{42}$$

This equation introduces a new notation for the expected inflation path before updating. For the March 2021 survey, $\pi^{belief}_{1|0}$ is the initial inflation expectation for 2021Q2, $\pi^{belief}_{2|0}$ is the initial inflation expectation for 2021Q3, and $\pi^{belief}_{3|0}$ is the initial inflation expectation for 2021Q4, conditional only on the policy announcement for period zero. As in the learning literature, agents update their expected path for inflation (i.e., their expectation for inflation in period s for all $s \geq t$) in period $t = 2, 3, \ldots$ based on the equilibrium outcome in period $t-1$:

$$\pi^{belief}_{s|t} = \pi^{belief}_{s|t-1} + g\rho^{s-(t-1)}(\pi^{eq}_{t-1} - \pi^{belief}_{t-1|t-1}), \tag{43}$$

where $g > 0$ is a gain parameter and $\rho > 0$ is a perceived autocorrelation coefficient. We present a constant-gain learning microfoundation for this equation at the end of this appendix. With $g = 1$, the entire period-$(t-1)$ surprise is incorporated into beliefs, with a geometric attenuation $\rho^{s-(t-1)}$ across future horizons; with $0 < g < 1$ only a fraction of the surprise is absorbed. The last two equations hold for each period-zero policy announcement. Assuming the same g and ρ across policy announcements, they can be written in terms of differences across policy announcements:

$$d\pi^{belief}_{s|0} = d\pi^{survey}_{s}, \tag{44}$$

and

$$d\pi^{belief}_{s|t} = d\pi^{belief}_{s|t-1} + g\rho^{s-(t-1)}(d\pi^{eq}_{t-1} - d\pi^{belief}_{t-1|t-1}). \tag{45}$$

The same reasoning yields the following updating equations for the interest rate expectation and the real income expectation

$$di^{belief}_{s|t} = di^{belief}_{s|t-1} + g\rho^{s-(t-1)}(di^{eq}_{t-1} - di^{belief}_{t-1|t-1}), \tag{46}$$

and

$$dY^{belief}_{s|t} = dY^{belief}_{s|t-1} + g\rho^{s-(t-1)}(dY^{eq}_{t-1} - dY^{belief}_{t-1|t-1}), \tag{47}$$

with initial conditions

$$di_{s|0}^{belief} = di_s^{survey}, \tag{48}$$

and

$$dY_{s|0}^{belief} = dY_s^{survey}. \tag{49}$$

Finally, we present a constant-gain learning microfoundation for equation (43). Define for all $s > t$ and $t \geq 1$

$$\frac{IRF_s^\pi}{IRF_t^\pi} = \frac{\pi_s^{survey}}{\pi_t^{survey}}. \tag{50}$$

This equation introduces a new notation for expected inflation in period s before updating relative to expected inflation in period t before updating. Suppose that agents' perceived law of motion for inflation in any period t is that inflation in any period $s > t$ is some scale parameter α times the inflation rate they had expected for that period s before updating:

$$\pi_{s|t} = \alpha_t IRF_s^\pi, \tag{51}$$

where α_t is the belief about the scale parameter that agents hold in period t with $\alpha_0 = 1$. Suppose agents revise their beliefs about the level of the impulse response function (i.e., their belief about α) but not their belief about the shape of the impulse response function (i.e., the term IRF_s^π does not depend on t). This means if agents revise their belief about next period's inflation down by x percent, they also revise their beliefs about inflation in subsequent periods down by x percent. Put differently, updating beliefs about inflation means scaling the expected inflation path up or down by some factor. Next, let us turn to constant-gain learning. If agents revise their belief about α_t based on last period's equilibrium outcome and they believe that each period's equilibrium outcome is a noisy signal on the parameter of interest with i.i.d. normally distributed noise (which is a standard microfroundation for constant-gain learning), then the Kalman filter implies

$$\pi_{s|t}^{belief} = \pi_{s|t-1}^{belief} + g\frac{IRF_s^\pi}{IRF_{t-1}^\pi}(\pi_{t-1}^{eq} - \pi_{t-1|t-1}^{belief}), \tag{52}$$

where g is the Kalman gain and π_{t-1}^{eq} is the equilibrium outcome in period $t-1$. Finally, if, in this calculation, agents approximate the ratio $\frac{IRF_s^\pi}{IRF_{t-1}^\pi}$ using the impulse response function of a first-order autocorrelated process with autocorrelation coefficient ρ, one arrives at equation (43).

G Instructions

G.1 Instructions: March 2021 survey

Attention check

The next question is about the following problem. In questionnaires like ours, sometimes there are participants who do not carefully read the questions and just quickly click through the survey. This means that there are a lot of random answers which compromise the results of research studies. **To show that you read our questions carefully, please choose both "Very strongly interested" and "Not at all interested" as your answer in the below question**

Given the above, how interested are you in politics?

- ☐ Very strongly interested
- ☐ Very interested
- ☐ A little bit interested
- ☐ Almost not interested
- ☐ Not at all interested

→

Demographics

In this survey we will ask you various times about things related to your **household**, such as the total income of your household. By household we mean all family members living with you in your main residence, but excluding roommates and renters.

Which of these describes you more accurately?

- ○ Male
- ○ Female

What is your age?

- ○ 18 - 24
- ○ 25 - 34
- ○ 35 - 44
- ○ 45 - 54
- ○ 55 - 64
- ○ 65 or older

In which region do you currently reside?

- ○ Northeast (CT, ME, MA, NH, RI, VT, NJ, NY,PA),
- ○ Midwest (IL, IN, MI, OH, WI, IA, KS, MN, MO, NE, ND, SD)
- ○ South (DE, DC, FL, GA,MD, NC, SC, VA, WV, AL, KY, MS, TN, AR, LA, OK, TX)
- ○ West (AZ, CO, ID, NM, MT, UT,NV, WY, AK, CA, HI, OR, WA)

What is the highest level of education you have completed?

- ○ 12th grade or less
- ○ Graduated high school or equivalent
- ○ Some college, no degree
- ○ Associate degree
- ○ Bachelor's degree
- ○ Post-graduate degree

What was your total household net income in **2020** in US dollars after taxes and deductions?

Note: Your household's total net income includes your household's total income from all sources, including e.g. labor income, financial income and income from transfers, net of taxes.

What was your total household net income in **2020** in US dollars after taxes and deductions?
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Definitions

About this study

This study is about your **beliefs about the future development of the US economy, as well as your own economic situation.** Your task will be to report your expectations about the future development of both the US economy and your personal economic situation under different hypothetical scenarios.

On the next page, we will provide you with a brief definition. Please read it carefully!

→

Definition

The **inflation rate** measures how much prices in the economy rise from year to year. It is defined as the yearly growth of the general level of prices of goods and services (Consumer Price Index). For instance, an inflation rate of 2% means that, on average, prices for goods and services rise by 2% over 12 months. That is, a typical bundle of goods and services that costs $1,000 at the beginning of a year costs $1,020 at the end of that year. If the inflation rate is negative, it is referred to as deflation. This means that goods and services become less expensive from one year to the next.

→

The main part of the survey begins when you press on the next button. Please try to **make your responses as accurate as possible**.

It is very important for the success of our research that you answer to the best of your knowledge and read the questions very carefully before answering.

→

The federal funds rate

The **federal funds rate** is the most important interest rate in the economy, and is frequently discussed in the news. The value of the rate influences how "costly" it is for banks to acquire money, thereby influencing interest rates on important financial products, such as savings accounts, consumer loans, mortgages, or loans to firms.

The **Federal Reserve (Fed)** controls the federal funds rate. Besides choosing the current rate, the Fed publishes **projections** of where this interest rate will be in the coming years.

We will now ask you about your own expectations under two different hypothetical scenarios about the Fed's projections on the future federal funds rate.

Currently, the federal funds rate stands at **0.1 percent**. According to the projection by the Fed, the rate will remain at **0.1 percent** until the end of **2023**.

→

Baseline scenario

Baseline scenario: Projected federal funds rate stays constant

We now would like to ask you to imagine the following hypothetical scenario.

Please imagine that at the next meeting of the Fed on March 16/17 2021, the Fed announces that the **current** federal funds rate will remain **unchanged at 0.1 percent**.

Moreover, the Fed announces that its projection about the **future** federal funds rate at the **end of 2023** remains **unchanged at 0.1 percent**.

Note: Further, imagine that the Fed's projection of the federal funds rate at the end of 2030 remains **unchanged** at 2.5 percent.

Your predictions

Imagine that on March 18 2021, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, the inflation rate, and your net household income.

Under this hypothetical scenario, what would be **your own expectations** about the **future federal funds rate?**

Note: As an example, for an expected federal funds of 0.1%, please enter 0.1.

Federal funds rate at the end of **2021** (in %):
Federal funds rate at the end of **2022** (in %):
Federal funds rate at the end of **2023** (in %):
Federal funds rate at the end of **2026** (in %):
Federal funds rate at the end of **2030** (in %):

And what would be your expectations about **the future rate of inflation** under the hypothetical scenario if you learned about the Fed's announcement?

Note: As an example, if you think inflation will be 2%, please enter 2.

Reminder: Respond under the assumption that the Fed's projection of the end-2023 federal funds rate remains at 0.1 percent in their meeting on March 17, 2021.

Inflation over the year **2021** (in %):
Inflation over the year **2022** (in %):
Inflation over the year **2023** (in %):
Average annual inflation over the years **2024-2026** (in %):

And what would be your expectations about your **households' future total net income (after taxes and deductions)** under the hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that the Fed's projection of the end-2023 federal funds rate remains at 0.1 in their meeting on March 17, 2021.

Total household net income in the year **2021**:

Total household net income in the year **2021** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly total household net income in the years **2022-2023**:

Average yearly total household net income in the years **2022-2023** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly total household net income in the years **2024-2026**:

Average yearly total household net income in the years **2024-2026** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

Transition between baseline and rise scenario

Important!

On the next page, you will read a scenario that describes a change in the Fed's projections. We will ask you how the change in the Fed's projections would affect your expectations about the future federal funds rate, the US inflation rate and your household's income.

→

Source of the policy change: "No reason" group

Hypothetical scenario: Federal funds rate projection for 2023 increases

We will now ask you to consider the following alternative hypothetical scenario. Please imagine that at their next meeting on March 16/17 2021, the Fed announces that the **current** federal funds rate will remain **unchanged at 0.1 percent**.

However, the Fed announces that its projection about the **future** federal funds rate at the **end of 2023 increases from 0.1 percent to 0.5 percent**.

Note: Further, imagine that the Fed's projection of the federal funds rate at the end of 2030 remains **unchanged** at 2.5 percent.

Source of the policy change: "Endogenous" group

Hypothetical scenario: Federal funds rate projection for 2023 increases

We will now ask you to consider the following alternative hypothetical scenario. Please imagine that at their next meeting on March 16/17 2021, the Fed announces that the **current** federal funds rate will remain **unchanged at 0.1 percent**.

However, the Fed announces that its projection about the **future** federal funds rate at the **end of 2023 increases from 0.1 percent to 0.5 percent**.

The Fed explains that the change in the Fed's projection about the future federal funds rate is due to **a change** in the Fed's outlook on **the broader development of the economy**.

Note: Further, imagine that the Fed's projection of the federal funds rate at the end of 2030 remains **unchanged** at 2.5 percent.

Source of the policy change: "Exogenous" group

Hypothetical scenario: Federal funds rate projection for 2023 increases

We will now ask you to consider the following alternative hypothetical scenario.

Please imagine that at their next meeting on March 16/17 2021, the Fed announces that the **current** federal funds rate will remain **unchanged at 0.1 percent**.

However, the Fed announces that its projection about the **future** federal funds rate at the **end of 2023 increases from 0.1 percent to 0.5 percent**.

The Fed explains that the change in the Fed's projection about the future federal funds rate occurred because the **composition** of the committee **changed** before the meeting on March 16-17 2021. In particular, some more "dovish" members, whose terms ended, left the Fed, and some more "hawkish" members joined the Fed. The change in the projection is **not** due to a change in the Fed's outlook on the broader development of the economy.

Note: Further, imagine that the Fed's projection of the federal funds rate at the end of 2030 remains **unchanged** at 2.5 percent.

Source of the policy change: “Exogenous with stocks” group

Hypothetical scenario: Federal funds rate projection for 2023 increases

We will now ask you to consider the following alternative hypothetical scenario.

Please imagine that at their next meeting on March 16/17 2021, the Fed announces that the **current** federal funds rate will remain **unchanged at 0.1 percent**.

However, the Fed announces that its projection about the future federal funds rate at the end of 2023 increases from 0.1 percent to 0.5 percent.

The Fed explains that the change in the Fed’s projection about the future federal funds rate occurred because the **composition** of the committee **changed** before the meeting on March 16-17 2021. In particular, some more “dovish” members, whose terms ended, left the Fed, and some more “hawkish” members joined the Fed. The change in the projection is **not** due to a change in the Fed’s outlook on the broader development of the economy.

In response to the Fed annoucement, the **S&P 500 stock market index falls** by 1 percent.

Note: Further, imagine that the Fed's projection of the federal funds rate at the end of 2030 remains **unchanged** at 2.5 percent.

Rise scenario

Your predictions

Imagine that on March 18, i.e. **on the day after the Fed meeting**, you learn about the Fed’s announcement and the response of the S&P 500 stock market index. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, the inflation rate and your net household income.

Under the alternative hypothetical scenario (the Fed’s projection of the end-2023 federal funds rate increases from 0.1 to 0.5 percent), what would be **your own expectations** about the **future federal funds rate?**

Federal funds rate at the end of **2021** (in %):

Federal funds rate at the end of **2022** (in %):

Federal funds rate at the end of **2023** (in %):

Federal funds rate at the end of **2026** (in %):

Federal funds rate at the end of **2030** (in %):

And what would be your expectations about **the future rate of inflation** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that the Fed's projection of the end-2023 federal funds rate increases from 0.1 to 0.5 percent in their meeting on March 17, 2021.

Inflation over the year **2021** (in %):

Inflation over the year **2022** (in %):

Inflation over the year **2023** (in %):

Average annual inflation over the years **2024-2026** (in %):

And what would be your expectations about your **households' future total net income (after taxes and deductions)** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that the Fed's projection of the end-2023 federal funds rate increases from 0.1 to 0.5 percent in their meeting on March 17, 2021.

Household net income in the year **2021**:

Household net income in the year **2021** (in $):

Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2022-2023**:

Average yearly household net income in the years **2022-2023**: (in $):

Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average household net income in the years **2024-2026**:

Average yearly household net income in the years **2024-2026** (in $):

Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

Inattention to Fed announcements

Announcements by the Fed

Now please think of **announcements by the Federal Reserve in general**. When the Fed makes an announcement, how long would you say does it typically take until you hear of such an announcement?

- ○ Less than seven days
- ○ Seven to 14 days
- ○ Two to four weeks
- ● One to three months
- ○ Four to six months
- ○ Longer than six months
- ○ Typically I would never hear of such an announcement.

Now please think of **movements of the stock market in response to announcements by the Federal Reserve**. When the stock market moves in response to a Fed announcement, how long would you say does it typically take until you hear of such a movement?

- ○ Less than seven days
- ○ Seven to 14 days
- ○ Two to four weeks
- ○ One to three months
- ○ Four to six months
- ○ Longer than six months
- ○ Typically I would never hear of such a movement.

Additional characteristics

Your household's situation

Please think of the **main earner** in your household, i.e. the person that contributes most to your household's income. Who is the main earner in your household?

- ○ I am the main earner.
- ○ My spouse / partner is the main earner.
- ○ Someone else is the main earner.

Which of these describes the labor market situation of the **main earner** in your household most accurately?

- ○ Employed full-time
- ○ Employed part-time
- ○ Self-employed
- ○ Unemployed and looking for a job
- ○ Unemployed but not looking for a job
- ○ Retired
- ○ Student
- ○ Other:

→

What was the amount of your **main earner's last net labor income after taxes and deductions** (e.g. social security contributions)?

Between $300 and $500

What period of time did this cover?

- ○ One week
- ○ Two weeks
- ○ Month
- ○ Quarter
- ○ Year
- ○ Other

→

What were your household's holdings of **liquid wealth** on the **last days before** the **main earner** in your household received his or her **last income**? By liquid wealth we mean **cash, bank accounts or other easily accessible savings**, such as mutual funds, stocks and bonds that can be sold within a few days.

→

Did your household **pay** all its credit card bills in full **at the end of the last billing cycle**? That is, did your household start the new billing cycle with a **zero credit card balance** on all cards?

- ○ Yes
- ○ No

→

If you think of all credit cards your household owns, what is the **maximum combined amount your household could borrow** on credit cards (in $)?

For instance, let's say your household owns three credit cards. Then, the maximum combined amount your household could borrow on credit cards is the sum of the three credit limits.

→

What would you say is the probability that --- at any point in the next years -- your household will be in a situation where your household would like to **borrow more money** on its credit cards, but would be **unable** to do so (i.e. to be borrowing constrained)?

Probability of being borrowing constrained in **2021**:

Probability of being borrowing constrained in **2021** or **2022**:

Probability of being borrowing constrained at any point in time **until the end 2026**:

→

We now would like you to think about your households' **spending behavior in recent years**. Which of the following four types **describes your household most accurately**?

- ○ My household usually spends its entire income, and does not put aside any money to save or to pay back debt, but also does not increase debt through new borrowing.
- ○ My household usually does not spend its entire income, but puts aside some money to save or to pay back debt.
- ○ My household usually spends more than its income by increasing its debt through new borrowing.
- ○ My household usually spends more than its income by reducing its savings.

In case of an unexpected decline in income or increase in expenses, does your household have at least two months of income available in cash, bank accounts, or easily accessible funds?

- ○ Yes
- ○ No

→

Additional characteristics

In general, how willing or unwilling are you to **take risks**, using a scale from 0 to 10, where 0 means you are “completely unwilling to take risks” and 10 means you are “very willing to take risks.” You can also use any number between 0 and 10 to indicate where you fall on the scale.

0 - completely unwilling to take risks	1	2	3	4	5	6	7	8	9	10 - very willing to take risks
○	○	○	○	○	○	○	○	○	○	○

In comparison to others, are you a person who is generally willing to **give up something today** in order to **benefit from that in the future** or are you not willing to do so? Please use a scale from 0 to 10, where a 0 means you are “completely unwilling to give up something today” and a 10 means you are “very willing to give up something today”. You can also use any number between 0 and 10 to indicate where you fall on the scale.

0 - completely unwilling to give up something today	1	2	3	4	5	6	7	8	9	10 - very willing to give up something today
○	○	○	○	○	○	○	○	○	○	○

To what extent do you agree with the following statement?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
A recession would adversely affect the financial situation of my household.	○	○	○	○	○	○	○

→

Next we would like to ask you three questions to see how people use numbers in everyday life. Please answer the following questions by filling in the blank.

Let's say you have $200 in a savings account. The account earns ten percent interest per year. Interest accrues at each anniversary of the account. If you never withdraw money or interest payments, how much will you have in the account at the end of two years (in $)?

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

- ○ More than today
- ○ Exactly the same
- ○ Less than today

Please tell me whether this statement is true or false: Buying a single company’s stock usually provides a safer return than a stock mutual fund.

- ○ True
- ○ False

What was your household's **savings rate** in 2020 (in percent)?

Note: This refers to the fraction of your household's net income that your household put aside to save.
For instance, if your household spent 95 percent of its net income and saved 5 percent of its net income, then your household's savings rate was 5 percent.
If your household spent 10 percent more than its net income, then your household's savings rate was -10 percent.

→

Next we would like to ask you **which member** of your household has the **best overview** of the household's finances. By that we mean things such as income, savings and checking accounts, pensions, real estate. Who among the household members living in your household **knows the most** about the household's finances?

- I know most about the household's finances.
- My spouse knows most about the household's finances.
- Someone else.

Does your household own or rent its current main residence?

- Own
- Rent
- Other

What do you estimate is the current value of your household's total holdings of **stocks in publicly held corporations and stock mutual funds, including holdings in retirement accounts?**

- Less than $1,000
- Between $1,000 and $3,000
- Between $3,000 and $5,000
- Between $5,000 and $10,000
- Between $10,000 and $15,000
- Between $15,000 and $20,000
- Between $20,000 and $30,000
- Between $30,000 and $40,000
- Between $40,000 and $50,000
- Between $50,000 and $75,000
- Between $75,000 and $100,000
- Between $100,000 and $150,000
- Between $150,000 and $200,000
- Between $200,000 and $300,000
- Between $300,000 and $500,000
- Between $500,000 and $1,000,000
- Between $1,000,000 and $2,000,000
- More than $2,000,000

How many people usually live in your current primary residence, including yourself and those who are temporarily away, but excluding non-relatives like roommates or renters?

What was your household's total net income in **2019** in US dollars after taxes and deductions?

What was your household's total net income in **2019** in US dollars after taxes and deductions?
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

We will now ask you some questions on how you are personally affected by the coronavirus pandemic.

What influence does the coronavirus crisis exert on the **economic situation** of your household?

- ○ Very negative influence
- ○ Negative influence
- ○ No influence
- ○ Positive influence
- ○ Very positive influence

Do you worry about your **health** or the health of other household members because of the coronvirus crisis?

- ○ No worries at all
- ○ Little worries
- ○ Moderate worries
- ○ Big worries
- ○ Very big worries

→

G.2 Instructions: March 2022 survey

Baseline scenario

The federal funds rate

The **federal funds rate** is the most important interest rate in the economy, and is frequently discussed in the news. The value of the rate influences how "costly" it is for banks to acquire money, thereby influencing interest rates on important financial products, such as savings accounts, consumer loans, mortgages, or loans to firms.

The **Federal Reserve (Fed)** controls the federal funds rate. Besides choosing the current rate, the Fed publishes projections of where this interest rate will be in the coming years.

We will now ask you about your own expectations under two different hypothetical scenarios about the Fed's decision about the current federal funds rate.

Currently, the federal funds rate stands at **0.1 percent**. According to the projection by the Fed, the rate will increase to 2.5 percent until the end of 2031.

→

Baseline scenario: Federal funds rate stays constant

We now would like to ask you to imagine the following hypothetical scenario.

Please imagine that at the next meeting of the Fed on March 15/16 2022, the Fed decides to keep the current federal funds rate **unchanged at 0.1 percent**.

Note: Further imagine that the Fed's projection for the federal funds rate at the end of 2031 remains **unchanged** at 2.5 percent.

Your predictions

Imagine that on March 17 2022, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, the inflation rate and your net household income.

Under this hypothetical scenario, what would be **your own expectations** about the **future federal funds rate?**

Note: As an example, if you think the federal funds rate will be at 0.1%, please enter 0.1

Federal funds rate at the end of **2022** (in %):
Federal funds rate at the end of **2023** (in %):
Federal funds rate at the end of **2024** (in %):
Federal funds rate at the end of **2027** (in %):
Federal funds rate at the end of **2031** (in %):

And what would be your expectations about **the future rate of inflation** under the hypothetical scenario if you learned about the Fed's announcement?
Note: As an example, if you think inflation will be 2%, please enter 2.

Reminder: Respond under the assumption that in the Fed meeting on March 15/16 2022 the Fed decides to keep the federal funds rate at 0.1 percent.

Inflation over the year **2022** (in %):
Inflation over the year **2023** (in %):
Inflation over the year **2024** (in %):
Average annual inflation over the years **2025-2027** (in %):

And what would be your expectations about your **household's future total net income (after taxes and deductions)** under the hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on March 15/16 2022 the Fed decides to keep the federal funds rate at 0.1 percent.

Household net income in the year **2022**:

Household net income in the year **2022** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2023-2024**:

Average yearly household net income in the years **2023-2024** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2025-2027**:

Average yearly household net income in the years **2025-2027** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

Transition between baseline and rise scenario

Important!

On the next page, you will read a scenario that describes a change in the Fed's fund rate. We will ask you how the change in the current federal funds rate would affect your expectations about the future federal funds rate, the US inflation rate and your household's income.

Rise scenario

Hypothetical scenario: Federal funds rate increases

We will now ask you to consider the following alternative hypothetical scenario.

Please imagine that at the next meeting of the Fed on March 15/16 2022, the Fed **increases** the current federal funds rate **from 0.1 to 0.5 percent**.

Note: Further imagine that the Fed's projection for the federal funds rate at the end of 2031 remains **unchanged** at 2.5 percent.

Your predictions

Imagine that on March 17 2022, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, the inflation rate and your net household income.

Under the alternative hypothetical scenario (the current federal funds rate increases from 0.1 to 0.5 percent), what would be **your own expectations** about the **future federal funds rate?**

Federal funds rate at the end of **2022** (in %):
Federal funds rate at the end of **2023** (in %):
Federal funds rate at the end of **2024** (in %):
Federal funds rate at the end of **2027** (in %):
Federal funds rate at the end of **2031** (in %):

And what would be your expectations about **the future rate of inflation** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on March 15/16 2022 the Fed decides to increase the federal funds rate from 0.1 to 0.5 percent.

Inflation over the year **2022** (in %):
Inflation over the year **2023** (in %):
Inflation over the year **2024** (in %):
Average annual inflation over the years **2025-2027 (in %):**

And what would be your expectations about your **household's future total net income (after taxes and deductions)** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on March 15/16 2022 the Fed decides to increase the federal funds rate from 0.1 to 0.5 percent.

Household net income in the year **2022**:

Household net income in the year **2022** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2023-2024**:

Average yearly household net income in the years **2023-2024**: (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average household net income in the years **2025-2027**:

Average yearly household net income in the years **2025-2027** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

Inattention to Fed announcements

Announcements by the Fed

How often have news about the Federal Reserve come to your attention in the **last four weeks**?

- ○ Never
- ○ Once
- ○ 2 times
- ○ 3 times
- ○ 4 times
- ○ More than 5 times

How often do you **typically** hear news about the Federal Reserve?

- ○ Daily
- ○ Weekly
- ○ Between 2 and 3 times per month
- ○ About once per month
- ○ Between 1 and 2 times per quarter
- ○ Less frequently than once per quarter
- ○ Never

Think of the news **over the last three months**. The next four statements describe different pieces of news. One or more of these statements describe actual pieces of news, while the rest are made up. Which one(s) is/are actual pieces of news? Please click on all that apply.

- [ ] There was an international meeting of central bankers in San Francisco followed by a speech by the chairman of the Federal Reserve
- [ ] The Federal Reserve increased its main interest rate, the federal funds rate
- [ ] Jerome Powell was renominated as chairman of the Federal Reserve
- [ ] The Federal Reserve put in place new lending facilities to fight the recession

When do you think was the last time the Federal Reserve changed its main interest rate, the federal funds rate?

- ○ August 2012
- ○ September 2018
- ○ March 2020
- ○ March 2021
- ○ November 2021

Now please think of **announcements by the Federal Reserve in general**. When the Fed makes an announcement, how long would you say does it typically take until you hear of such an announcement?

- ○ Less than seven days
- ○ Seven to 14 days
- ○ Two to four weeks
- ○ One to three months
- ○ Four to six months
- ○ Longer than six months
- ○ Typically I would never hear of such an announcement.

G.3 Instructions: September 2022 survey

Baseline scenario

The federal funds rate

The **federal funds rate** is the most important interest rate in the economy, and is frequently discussed in the news. The value of the rate influences how "costly" it is for banks to acquire money, thereby influencing interest rates on important financial products, such as savings accounts, consumer loans, mortgages, or loans to firms.

The **Federal Reserve (Fed)** controls the federal funds rate. Besides choosing the current rate, the Fed publishes projections of where this interest rate will be in the coming years.

We will now ask you about your own expectations under two different hypothetical scenarios about the Fed's decision about the current federal funds rate.

Currently, the federal funds rate stands at **2.4 percent**. According to the projection by the Fed, the rate will increase to 2.5 percent until the end of 2031.

→

Baseline scenario: Federal funds rate stays constant

We now would like to ask you to imagine the following hypothetical scenario.

Please imagine that at the next meeting of the Fed on September 20/21 2022, the Fed decides to keep the current federal funds rate unchanged at **2.4 percent**.

Note: Further imagine that the Fed's projection for the federal funds rate at the end of 2031 remains **unchanged** at 2.5 percent.

Your predictions

Imagine that on September 22 2022, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, the inflation rate and your net household income.

Under this hypothetical scenario, what would be **your own expectations** about the **future federal funds rate?**

Note: As an example, if you think the federal funds rate will be at 0.1%, please enter 0.1

Federal funds rate at the end of **2022** (in %):

Federal funds rate at the end of **2023** (in %):

Federal funds rate at the end of **2024** (in %):

Federal funds rate at the end of **2027** (in %):

Federal funds rate at the end of **2031** (in %):

And what would be your expectations about **the future rate of inflation** under the hypothetical scenario if you learned about the Fed's announcement?
Note: As an example, if you think inflation will be 2%, please enter 2.

Reminder: Respond under the assumption that in the Fed meeting on September 20/21 2022 the Fed decides to keep the federal funds rate at 2.4 percent.

Inflation over the year **2022** (in %):
Inflation over the year **2023** (in %):
Inflation over the year **2024** (in %):
Average annual inflation over the years **2025-2027** (in %):

And what would be your expectations about your **household's future total net income (after taxes and deductions)** under the hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on September 20/21 2022 the Fed decides to keep the federal funds rate at 2.4 percent.

Household net income in the year **2022**:

Household net income in the year **2022** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2023-2024**:

Average yearly household net income in the years **2023-2024** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2025-2027**:

Average yearly household net income in the years **2025-2027** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

Transition between baseline and rise scenario

Important!

On the next page, you will read a scenario that describes an increase in the federal funds rate. We will ask you how the increase in the current federal funds rate would affect your expectations about the future federal funds rate, the US inflation rate and your household's income.

Rise scenario

Hypothetical scenario: Federal funds rate increases to 3.1 percent

We will now ask you to consider the following alternative hypothetical scenario.

Please imagine that at the next meeting of the Fed on September 20/21 2022, the Fed **decides to increase** the current federal funds rate **from 2.4 to 3.1 percent**.

Note: Further imagine that the Fed's projection for the federal funds rate at the end of 2031 remains **unchanged** at 2.5 percent.

Your predictions

Imagine that on September 22 2022, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, the inflation rate and your net household income.

Under the alternative hypothetical scenario (the current federal funds rate increases from 2.4 to 3.1 percent), what would be **your own expectations** about the **future federal funds rate?**

Federal funds rate at the end of **2022** (in %):
Federal funds rate at the end of **2023** (in %):
Federal funds rate at the end of **2024** (in %):
Federal funds rate at the end of **2027** (in %):
Federal funds rate at the end of **2031** (in %):

And what would be your expectations about **the future rate of inflation** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on September 20/21 2022 the Fed decides to increase the federal funds rate from 2.4 to 3.1 percent.

Inflation over the year **2022** (in %):
Inflation over the year **2023** (in %):
Inflation over the year **2024** (in %):
Average annual inflation over the years **2025-2027 (in %):**

And what would be your expectations about your **household's future total net income (after taxes and deductions)** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on September 20/21 2022 the Fed decides to increase the federal funds rate from 2.4 to 3.1 percent.

Household net income in the year **2022**:

Household net income in the year **2022** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2023-2024**:

Average yearly household net income in the years **2023-2024** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2025-2027**:

Average yearly household net income in the years **2025-2027** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

Spending plans

You just now completed two scenarios about the Fed meeting on September 20/21 2022:

- **No-change Scenario**: In the Fed meeting on September 20/21 2022 the Fed decides to keep the federal funds rate at **2.4 percent**.
- **Rise Scenario**: In the Fed meeting on September 20/21 2022 the Fed decides to **increase** the federal funds rate **from 2.4 percent to 3.1 percent**.

We will now ask you to assess under which scenario each of the following statements that describe your **spending plans over the next 3 months** is more likely to be true.

Under which scenario would your household …

	No-change scenario (**no change** in the current federal funds rate)	Same in both scenarios	Rise scenario (**increase** in the current federal funds rate from **2.4 percent to 3.1 percent**)
… be more likely to **reduce purchases of items** that you consider to be **non-essential**?	○	○	○
… be more likely to **cut back** on the **quality** of the goods and services consumed, e.g., to purchase store brands instead of name brands?	○	○	○
… be more likely to **look for deals** to obtain the goods and services needed, e.g., to look for sales or rebates or to make use of coupons?	○	○	○
... make fewer purchases of **nondurable goods** and **services**, such as food, entertainment services or clothing?	○	○	○

→

Inattention to Fed announcements

Announcements by the Fed

How often have news about the Federal Reserve come to your attention in the **last four weeks**?

- ○ Never
- ○ Once
- ○ 2 times
- ○ 3 times
- ○ 4 times
- ○ 5 times or more often

How often do you **typically** hear news about the Federal Reserve?

- ○ Daily
- ○ Weekly
- ○ Between 2 and 3 times per month
- ○ About once per month
- ○ Between 1 and 2 times per quarter
- ○ Less frequently than once per quarter
- ○ Never

Think of the news **over the last three months**. The next four statements describe different pieces of news. One or more of these statements describe actual pieces of news, while the rest are made up. Which one(s) is/are actual pieces of news? Please click on all that apply.

- ☐ There was an international meeting of central bankers in San Francisco followed by a speech by the chairman of the Federal Reserve
- ☐ The Federal Reserve increased its main interest rate, the federal funds rate
- ☐ Jerome Powell was renominated as chairman of the Federal Reserve
- ☐ The Federal Reserve put in place new lending facilities to support the economy

When do you think was the last time the Federal Reserve changed its main interest rate, the federal funds rate?

- ○ July 2022
- ○ March 2022
- ○ November 2021
- ○ March 2021
- ○ March 2020

Now please think of **announcements by the Federal Reserve in general**. When the Fed makes an announcement, how long would you say does it typically take until you hear of such an announcement?

- ○ Less than seven days
- ○ Seven to 14 days
- ○ Two to four weeks
- ○ One to three months
- ○ Four to six months
- ○ Longer than six months
- ○ Typically I would never hear of such an announcement.

G.4 Instructions: September 2025 survey

Baseline scenario

The federal funds rate

The **federal funds rate** is the most important interest rate in the economy, and is frequently discussed in the news. The value of the rate influences how "costly" it is for banks to acquire money, thereby influencing interest rates on important financial products, such as savings accounts, consumer loans, mortgages, or loans to firms.

The **Federal Reserve (Fed)** controls the federal funds rate. Besides choosing the current rate, the Fed publishes projections of where this interest rate will be in the coming years.

We will now ask you about your own expectations under two different hypothetical scenarios about the Fed's decision about the current federal funds rate.

Currently, the federal funds rate stands at **4.4 percent**. According to the projection by the Fed, the rate will decrease to 3.0 percent until the end of 2034.

→

Baseline scenario: Federal funds rate stays constant

We now would like to ask you to imagine the following hypothetical scenario.

Please imagine that at the next meeting of the Fed on September 16/17 2025, the Fed decides to keep the current federal funds rate unchanged at **4.4 percent**.

Note: Further imagine that the Fed's projection for the federal funds rate at the end of 2034 remains **unchanged** at 3 percent.

Your predictions

Imagine that on September 18 2025, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, the inflation rate and your net household income.

Under this hypothetical scenario, what would be **your own expectations** about the **future federal funds rate?**

Note: As an example, if you think the federal funds rate will be at 0.1%, please enter 0.1

Federal funds rate at the end of **2025** (in %):

Federal funds rate at the end of **2026** (in %):

Federal funds rate at the end of **2027** (in %):

Federal funds rate at the end of **2030** (in %):

Federal funds rate at the end of **2034** (in %):

And what would be your expectations about **the future rate of inflation** under the hypothetical scenario if you learned about the Fed's announcement?
Note: As an example, if you think inflation will be 2%, please enter 2.

Reminder: Respond under the assumption that in the Fed meeting on September 16/17 2025 the Fed decides to keep the federal funds rate at 4.4 percent.

Inflation over the year **2025** (in %):
Inflation over the year **2026** (in %):
Inflation over the year **2027** (in %):
Average annual inflation over the years **2028-2030** (in %):

And what would be your expectations about your **household's future total net income (after taxes and deductions)** under the hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on September 16/17 2025 the Fed decides to keep the federal funds rate at 4.4 percent.

Household net income in the year **2025**:

Household net income in the year **2025** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2026-2027**:

Average yearly household net income in the years **2026-2027** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2028-2030**:

Average yearly household net income in the years **2028-2030** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

Transition between baseline and fall scenario

Important!

On the next page, you will read a scenario that describes a decrease in the federal funds rate. We will ask you how the decrease in the current federal funds rate would affect your expectations about the future federal funds rate, the US inflation rate and your household's income.

→

Fall scenario

Hypothetical scenario: Federal funds rate decreases to 3.9 percent

We will now ask you to consider the following alternative hypothetical scenario.

Please imagine that at the next meeting of the Fed on September 16/17 2025, the Fed **decides to decrease** the current federal funds rate **from 4.4 to 3.9 percent**.

Note: Further imagine that the Fed's projection for the federal funds rate at the end of 2034 remains **unchanged** at 3.0 percent.

Your predictions

Imagine that on September 18 2025, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, the inflation rate and your net household income.

Under the alternative hypothetical scenario (the current federal funds rate decreases from 4.4 to 3.9 percent), what would be **your own expectations** about the **future federal funds rate?**

Federal funds rate at the end of **2025** (in %):
Federal funds rate at the end of **2026** (in %):
Federal funds rate at the end of **2027** (in %):
Federal funds rate at the end of **2030** (in %):
Federal funds rate at the end of **2034** (in %):

And what would be your expectations about **the future rate of inflation** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on September 16/17 2025 the Fed decides to decrease the federal funds rate from 4.4 to 3.9 percent.

Inflation over the year **2025** (in %):
Inflation over the year **2026** (in %):
Inflation over the year **2027** (in %):
Average annual inflation over the years **2028-2030 (in %):**

And what would be your expectations about your **household's future total net income (after taxes and deductions)** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that in the Fed meeting on September 16/17 2025 the Fed decides to decrease the federal funds rate from 4.4 to 3.9 percent.

Household net income in the year **2025**:

Household net income in the year **2025** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2026-2027**:

Average yearly household net income in the years **2026-2027** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

Average yearly household net income in the years **2028-2030**:

Average yearly household net income in the years **2028-2030** (in $):
Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

→

Inattention to Fed announcements

Announcements by the Fed

How often have news about the Federal Reserve come to your attention in the **last four weeks**?

- ○ Never
- ○ Once
- ○ 2 times
- ○ 3 times
- ○ 4 times
- ○ 5 times or more often

How often do you **typically** hear news about the Federal Reserve?

- ○ Daily
- ○ Weekly
- ○ Between 2 and 3 times per month
- ○ About once per month
- ○ Between 1 and 2 times per quarter
- ○ Less frequently than once per quarter
- ○ Never

Now please think of **announcements by the Federal Reserve in general**. When the Fed makes an announcement, how long would you say does it typically take until you hear of such an announcement?

- ○ Less than seven days
- ○ Seven to 14 days
- ○ Two to four weeks
- ○ One to three months
- ○ Four to six months
- ○ Longer than six months
- ○ Typically I would never hear of such an announcement.

→

G.5 Instructions: Additional survey (March 2021)

Baseline scenario

Baseline scenario: Projected federal funds rate stays constant

We now would like to ask you to imagine the following hypothetical scenario.

Please imagine that at the next meeting of the Fed on March 16/17 2021, the Fed announces that the **current** federal funds rate will remain **unchanged at 0.1 percent**.

Moreover, the Fed announces that its projection about the **future** federal funds rate at the **end of 2023** remains **unchanged at 0.1 percent**.

Note: Further, imagine that the Fed's projection of the federal funds rate at the end of 2030 remains **unchanged** at 2.5 percent.

Your predictions

Imagine that on March 18 2021, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, unemployment rate, your borrowing and the value of your residence.

Under this hypothetical scenario, what would be **your own expectations** about the **future federal funds rate?**

Note: As an example, for an expected federal funds of 0.1%, please enter 0.1.

Federal funds rate at the end of **2021** (in %):
Federal funds rate at the end of **2022** (in %):
Federal funds rate at the end of **2023** (in %):
Federal funds rate at the end of **2026** (in %):
Federal funds rate at the end of **2030** (in %):

Please think of your household's current main residence (which you may own or rent).

What would be your expectations about the **value** of this residence in the year **2023** under the hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that the Fed's projection of the end-2023 federal funds rate remaints at 0.1 in their meeting on March 17, 2021.

What would be your expectations about the **value** of this residence in the year **2023** under the hypothetical scenario if you learned about the Fed's announcement?

Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

And what would be your expectations about your household's borrowing under the hypothetical scenario if you learned about the Fed's announcement? Would you expect to -- at any point -- be in a situation where your household would like to borrow more money on its credit cards, but would be unable to do so (i.e. to be borrowing constrained)?

Reminder: Respond under the assumption that the Fed's projection of the end-2023 federal funds rate remains at 0.1 in their meeting on March 17, 2021.

Probability of being borrowing constrained in 2021:

Probability of being borrowing constrained in 2021 or 2022:

Probability of being borrowing constrained at some point in time until the end 2026 (in %):

→

Transition between baseline and rise scenario

Important!

On the next page, you will read a scenario that describes a change in the Fed's projections. We will ask you how the change in the Fed's projections would affect your expectations about the future federal funds rate, the value of your residence and your borrowing.

Rise scenario

Your predictions

Imagine that on March 18, i.e. **on the day after the Fed meeting**, you learn about the Fed's announcement. Imagine that we would then ask you about **your own expectations** regarding the federal funds rate, your borrowing and the value of your residence.

Under the alternative hypothetical scenario (the Fed's projection of the end-2023 federal funds rate increases from 0.1 to 0.5 percent), what would be **your own expectations** about the **future federal funds rate?**

Federal funds rate at the end of **2021** (in %):
Federal funds rate at the end of **2022** (in %):
Federal funds rate at the end of **2023** (in %):
Federal funds rate at the end of **2026** (in %):
Federal funds rate at the end of **2030** (in %):

Please think of your household's current main residence (which you may own or rent).

What would be your expectations about the **value** of this residence in the year **2023** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Reminder: Respond under the assumption that the Fed's projection of the end-2023 federal funds rate increases from 0.1 to 0.5 percent in their meeting on March 17, 2021.

What would be your expectations about the **value** of this residence in the year **2023** under the alternative hypothetical scenario if you learned about the Fed's announcement?

Note: We would now ask you to enter an exact dollar amount which lies in the bracket specified above.

And what would be your expectations about your household's borrowing under the hypothetical scenario if you learned about the Fed's announcement? Would you expect to -- at any point -- be in a situation where your household would like to borrow more money on its credit cards, but would be unable to do so (i.e. to be borrowing constrained)?

Reminder: Respond under the assumption that the Fed's projection of the end-2023 federal funds rate increases from 0.1 to 0.5 percent in their meeting on March 17, 2021.

Probability of being borrowing constrained in 2021:

Probability of being borrowing constrained in 2021 or 2022:

Probability of being borrowing constrained at some point in time until the end 2026 (in %):

→