

Households' Macroeconomic Beliefs: The Role of Education*

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Abstract

We design a novel survey to study how education shapes households' joint beliefs about inflation, unemployment, and monetary policy transmission. College-educated respondents perceive the inflation-unemployment trade-off and hold views similar to professional forecasters, while less educated respondents favor supply-side narratives. When exposed to hypothetical monetary policy interventions, the more educated update expectations and adjust consumption and saving in line with standard models, whereas the less educated display greater rigidity. This education gradient persists after controlling for information sources, financial literacy, and institutional trust, pointing to differences in abstract reasoning. Open-ended responses are consistent with college-educated households holding mental models aligned with standard macroeconomic theory.

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JEL codes: D83, D84, E31, E52, I21.

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1 Introduction

A growing literature documents heterogeneity in expectations about aggregate variables such as inflation and economic activity (Mankiw et al., 2003, Coibion and Gorodnichenko, 2015, Giglio et al., 2021, Weber et al., 2022, Link et al., 2023). This heterogeneity has consequences for monetary policy, which operates primarily through expectation management: households with different beliefs about aggregate dynamics draw different inferences from the same policy action, weakening its transmission (Ball et al., 2005, Paciello and Wiederholt, 2014, Angeletos and Lian, 2017). Identifying which dimensions of heterogeneity shape macroeconomic reasoning is therefore central to both theory and policy.

This paper asks whether education shapes how households understand core macroeconomic relationships, with a focus on the interaction between inflation and unemployment, and the transmission of monetary policy to the economy. Answering these questions requires moving beyond how expectations are usually studied. Most evidence analyzes one variable at a time, typically inflation. Yet macroeconomic reasoning is inherently multivariate: in standard frameworks, beliefs about inflation, unemployment, and interest rates are jointly linked through equilibrium restrictions and policy trade-offs (Woodford, 2003, Galí, 2008). Two individuals may hold equally accurate inflation forecasts yet reason very differently about the broader environment, and so respond differently to the same policy. A multivariate perspective is thus necessary to understand how households think about the macroeconomy and the role played by education.

Our analysis draws on a novel survey module fielded to a representative sample of households in the Dutch LISS Panel. The module elicits households' perceptions and expectations for inflation and unemployment and links to the LISS Core Study, which provides rich information on respondents' socioeconomic characteristics. We proceed in three steps. First, we examine the cross-sectional correlation between inflation and unemployment expectations—a direct window onto whether households perceive the central trade-off facing monetary policy. While informative, this correlation is only suggestive: its sign depends on the type of shock households have in mind and so, by itself, cannot reveal how they reason about the economy. Therefore, as a second step, we turn to beliefs formed in response to a specific, known shock. Using a vignette-based approach, we expose respondents to a hypothetical exogenous change in the policy rate, elicit one-year-ahead expectations for inflation and unemployment under the scenario, and compare them to unconditional expectations reported earlier. The difference defines a subjective impulse response (SIR) for each variable. Third, we elicit intended spending and saving adjustments in response to the same shock to ask whether differences in reasoning carry over to behavior. A follow-up wave of the survey featuring open-ended questions was then conducted to elicit respondents' mental processes in addressing our questions.

Our main findings are the following. First, we show that college-educated households are substantially more likely to hold beliefs consistent with the multivariate restrictions of

standard macroeconomic frameworks. Cross-sectionally, we replicate the well-established finding that expected inflation and expected unemployment are positively correlated on average (Candia et al., 2020, Bhandari et al., 2024, Meeks and Monti, 2023, Kamdar and Ray, 2024)—a pattern usually read as a supply-side narrative in which inflation is simply “bad for the economy” (Binetti et al., 2024, Andre et al., 2026, Ferreira and Pica, 2025). As a novel result, we document that this average masks substantial heterogeneity by education: among college-educated respondents, the correlation turns negative, in line with a demand-driven view and with contemporaneous expectations in the ECB Survey of Professional Forecasters.

Second, our analysis of the responses to the hypothetical monetary policy shock reveals that the sign pattern of subjective impulse responses sorts respondents into mental models of monetary transmission. Those expecting lower inflation and higher unemployment after a tightening are *textbook* types (Smets and Wouters, 2007); those expecting higher inflation with weaker activity are *cost-channel* types (Christiano et al., 2005, Ravenna and Walsh, 2006); those expecting both to strengthen are consistent with an *information-channel* reading (Campbell et al., 2012, Nakamura and Steinsson, 2018); the remainder do not map onto standard frameworks. College-educated respondents are substantially more likely to display theory-consistent patterns, while those without a degree concentrate among non-theory-consistent types. Open-ended responses corroborate this finding: when asked to explain their reasoning in their own words, more educated respondents are significantly more likely to invoke textbook or cost-channel mechanisms.

Third, college-educated respondents are significantly more likely to cut spending and raise saving after the hypothetical shock—consistent with intertemporal substitution—and to articulate this logic explicitly. The education divide visible in beliefs thus also appears in behavior.

Fourth, we show that education does not merely stands in for some other characteristic correlated with it, which might in principle be the actual source of heterogeneity. More educated respondents have higher income and greater asset holdings, raising the private returns to tracking the macroeconomy (Malmendier and Nagel, 2016); they rely less on social media and more on newspapers, sources associated with less biased inflation expectations (D’Acunto and Weber, 2024); they score higher on financial literacy, which is linked to forecast accuracy (Lusardi and Mitchell, 2014); and they report greater institutional trust, suggesting stronger survey engagement. Yet adding these controls leaves the education gradient essentially unchanged, indicating that education is not merely a proxy for income, information sources, financial literacy, or trust.

What, then, does education capture? Our evidence points to more general reasoning skills—the ability to filter irrelevant information and to trace causal relationships—rather than to specific knowledge. This is consistent with work linking cognitive sophistication to the internal consistency of expectations (D’Acunto et al., 2023, Giglio et al., 2021), while shifting attention from univariate forecast accuracy to the structure of joint beliefs.

Because education is observable and targetable—unlike cognitive ability—these findings are relevant for the design of central bank communication and, more broadly, point to returns to education beyond the private wage premium.

Literature review. We contribute to a large literature documenting heterogeneity in inflation expectations. This dispersion is systematically related to observable characteristics and behavioral traits—age (de Bruin et al., 2010), gender (Reiche, 2023), political affiliation (Bachmann et al., 2021), financial exposure (Masolo and Monti, 2024), and personal experience (Malmendier and Nagel, 2016). A second strand instead attributes the same dispersion to information frictions and heterogeneous information environments (Mankiw and Reis, 2002, Reis, 2006, Coibion and Gorodnichenko, 2012), in which socioeconomic characteristics matter mainly because they shape the incentive to acquire information and the sources households rely on. Our evidence cuts across this divide: education matters not because it is one more trait, nor only because it sorts households into information sources, but because it relates to how households process information into *joint* beliefs about inflation, unemployment, and policy. In this respect we add to D’Acunto et al. (2023), who show that higher IQ leads to more accurate inflation forecasts, by shifting attention from the accuracy of single forecasts to the internal structure of beliefs.

A recent literature studies how policy shocks affect household expectations, using randomized information treatments (Knotek et al., 2024, Coibion et al., 2023a,b), high-frequency identification combined with local projections (Lewis et al., 2020, Ferreira and Pica, 2025), and event studies around policy announcements (Lamla and Vinogradov, 2019, DeFiore et al., 2022). We follow instead the vignette-based approach of Andre et al. (2022) and, more recently, Grigoli et al. (2026), who use hypothetical scenarios to elicit households’ expectations about macroeconomic shocks. We build on this approach in four ways. First, we complement the conditional analysis with unconditional evidence, showing that the education gradient extends beyond responses to a specific shock to the broader joint structure of beliefs. Second, we classify subjective models from the sign pattern of SIRs and show that consistency with theory varies sharply with education. Third, leveraging the rich background data in the LISS panel, we examine the channels linking education to macroeconomic understanding. Fourth, we complement the closed-ended elicitation with open-ended explanations, which recover the reasoning behind households’ answers and corroborate the model-based classification.

Households’ formation of *joint* beliefs about macroeconomic variables has recently attracted attention. Using long samples from the Michigan Survey of Consumers, Carvalho and Nechio (2014) and Dräger et al. (2016) ask whether the correlations households perceive among inflation, unemployment, and output are consistent with the Fisher equation, the Phillips curve, and the Taylor rule. Andre et al. (2022), Binetti et al. (2024), and Andre et al. (2026) document a supply-side reading of inflationary news and a perceived absence of the monetary-policy trade-off. Using cross-sectional aggregates rather than individual revi-

sions, Ferreira and Pica (2025) find that households expect both higher unemployment and higher inflation after an unexpected tightening. Where this work characterizes the representative household’s joint beliefs, we identify education as the dimension along which their consistency with theory varies—both unconditionally and in response to monetary policy shocks.

Finally, we add to work relating household characteristics and beliefs to choices. D’Acunto et al. (2023) show that, among high-IQ respondents, those expecting higher inflation are more likely to view it as a good time to buy durables, consistent with intertemporal substitution. Coibion et al. (2022) find that higher inflation expectations causally raise households’ monthly spending, especially among the highly educated, while Jiang et al. (2024) find that respondents with higher cognitive ability are more likely to hold spending steady than to cut it in response to higher inflation expectations. We complement these papers by tracing behavior to a monetary policy shock rather than to an inflation-related information treatment.

Roadmap. Section 2 describes the survey design and data. Section 3 presents evidence on unconditional belief correlations. Section 4 examines how beliefs respond to a monetary policy shock in a vignette scenario and maps these responses into interpretative models. Section 5 analyzes the channels linking education to macroeconomic reasoning. Section 6 concludes.

2 Data and design

2.1 The survey data

The survey data are collected through the LISS Panel, a household survey administered by Tilburg University (Centerdata Research Institute) in the Netherlands. The panel is based on a true probability sample of 5,000 households, drawn from the population register of Statistics Netherlands. Since 2007, the LISS panel has collected detailed background information on households through the LISS Core Study, a collection of annual survey modules investigating household economic and family status, as well as personality traits, values, and political ideologies. The LISS Panel allows external researchers to conduct their own survey modules, providing considerable flexibility in structure and design, including the ability to conduct survey experiments and pose vignette-style questions. The data of such external modules is therefore linked to the rich household-level information from the LISS Core Study, enabling to conduct heterogeneity analyses across various dimensions.

In May 2024, we recruited a sample of 1,500 respondents. As Table 1 shows, the sample closely matches the Dutch population on key demographic characteristics (gender, age, income, and educational attainment), using as a benchmark the Household Survey of the Dutch central bank, De Nederlandsche Bank (the DNB Household Survey). In August 2025,

we conducted a second wave, reinterviewing the same respondents.¹

All surveys were completed on the LISS Panel’s online platform. To ensure data quality we exclude respondents on the basis of completion time. We drop those whose total completion time falls below the 5th percentile of the distribution, which likely reflects insufficient attention, and those who took more than 48 hours to finish, which raises the risk that they forgot definitions and information presented at the start.² These filters follow common practice in the literature (e.g., Colarieti et al., 2024). After these exclusions, the main-survey sample consists of 1,318 individuals, on which the main analyses are conducted. For analyses that draw on the second wave, we use the 1,006 individuals who pass the completion-time filters in both waves.³ Furthermore, we winsorize the point forecasts of inflation and unemployment to limit the influence of outliers: values above the 95th percentile are set to the 95th-percentile value. This preserves the full sample while reducing the weight of extreme responses, and is standard in survey research (e.g., Kim and Binder, 2023).

2.2 Structure of the survey

The main survey is organized into an introductory block and two main parts.⁴ It opens with two questions measuring sentiment: respondents’ assessment of their financial situation relative to their peers, and their expectations about their own finances over the next twelve months.

The first part elicits perceptions and one-year-ahead expectations for three macroeconomic variables: CPI inflation, unemployment, and the mortgage rate on new loans. For each variable, respondents first receive a non-technical definition and a historical range, then report their perceived current value and their twelve-month-ahead forecast. We also ask about the main sources of information underlying each estimate.

The second part presents a monetary policy vignette. Respondents are randomly assigned to one of two scenarios: an unexpected rate increase (from 4.5% to 5%) or a rate decrease (from 4.5% to 4%), with no other contemporaneous shocks.⁵ Under their assigned scenario, respondents report one-year-ahead expectations for inflation and unemployment, the expected direction of stock-price changes (which helps separate a pure policy shock from an information effect; Jarociński and Karadi, 2020), and the intended direction of any adjustment to spending and saving. The survey also includes a placebo vignette describing an economically irrelevant event (the discovery of a copper mine in Australia, from which the Netherlands does not import), which lets us assess whether respondents correctly recognize

¹This follow-up wave was not pre-registered. Attrition was 21%, leaving 1,184 reinterviewed individuals.

²In the resulting sample, the median completion time for the main survey was 13 minutes and 28 seconds, and 91% of respondents finished within one hour.

³This second-wave sample is statistically comparable to the full main-survey sample along key demographic dimensions (Table A1).

⁴Figure A1 in Appendix A gives a graphical overview of the survey design, and the full survey text is reported in Appendix D.

⁵The randomization is performed by the LISS panel. The two groups are statistically comparable along key demographic dimensions.

when a shock has no domestic implications.

The second wave complements the first with two additions. It measures financial literacy through four standard questions on compound interest, inflation, risk diversification, and the time value of money (van Rooij et al., 2024), and re-elicits the same macroeconomic expectations as in the first wave. It also revisits the monetary policy vignette, now fixed to a 50-basis-point increase (from 2% to 2.5%), eliciting expected directional changes in inflation and unemployment and intended adjustments to spending and saving. Crucially, each block of closed questions is immediately followed by an open-ended prompt asking respondents to explain their reasoning: why they expect inflation and unemployment to move as indicated, and why they would adjust spending and saving accordingly.

2.3 Definition of education and other controls

As reported in Table 1, the median level of education in our sample is 16 years, which roughly corresponds to a bachelor’s degree in the Dutch system.⁶ Throughout the analysis, we capture educational heterogeneity with a binary indicator for above-median years of education (> 16 years of education); in our sample, this places respondents with at least a college degree above the median and those without one below it. We also observe each respondent’s area of study, which lets us examine whether the role of education varies by field.

In all main specifications, we include a set of background covariates from the LISS Core Study, which records detailed information on respondents’ socioeconomic conditions: net household income, employment status, homeownership, number of children, economic sentiment (about both one’s own situation and that of peers), and a comprehension score from the placebo vignette. Robustness checks add asset holdings (financial assets, private insurance, mortgage status), political orientation (0–10 left–right scale), and self-employment status. These controls are not elicited in our own module but come from the regularly updated LISS Core Study, which lets us shorten the survey, reduce respondent fatigue, and limit measurement error in key background variables.⁷

3 Joint beliefs on inflation and unemployment

One feature of our survey is that it measures expectations for inflation and unemployment jointly, alongside perceptions of current conditions. This lets us recover the directional changes in inflation and unemployment that each respondent has in mind, rather than only their expected levels.⁸ Concretely, we compute respondent-specific expected changes in

⁶See Appendix C for a description of the Dutch school system.

⁷Table A2 in Appendix A reports summary statistics for all variables used in the analysis, including the main outcomes, baseline controls, and additional covariates.

⁸Sanity checks reported in Appendix B confirm that the distributions of expected inflation and expected unemployment in our sample replicate the main findings in the literature on household macroeconomic expectations.

inflation and unemployment as

$$\Delta \mathbb{E}^i z_{t+1} = \underbrace{\mathbb{E}^i[z_{t+1}|\mathcal{I}_t]}_{\text{Prior}} - \underbrace{\mathbb{E}^i[z_t|\mathcal{I}_t]}_{\text{Perception}}$$

where $z \in \{\pi, u\}$, with π denoting inflation and u unemployment.⁹

Differencing expectations and perceptions nets out individual-level fixed components (persistent biases, misunderstandings of a variable’s definition, or personal interpretations of the underlying concept) that affect both the forecast and the current assessment. By focusing on expected changes, we strip away these stable individual effects and isolate respondents’ perceived dynamics of the macroeconomic variables.

A central relationship in macroeconomics is the Phillips correlation between unemployment and inflation, typically documented by regressing inflation on unemployment (Stock and Watson, 2020). A stylized fact in the survey literature is that households tend to associate high inflation with high unemployment, a pattern often read as a supply-side view of the economy (D’Acunto et al., 2024, Binetti et al., 2024). We replicate this pattern in our data. Figure 1 (left panel) presents a binned scatter plot of cross-sectional inflation changes against unemployment changes.¹⁰ The scatter plot points to a positive Phillips correlation, and the regressions in Table 2 confirm that this positive coefficient is robust to a standard set of controls. The pattern also holds with qualitative answers (whether respondents report each variable increasing, decreasing, or unchanged relative to current levels), which reduces sensitivity to outliers in the numerical responses.

3.1 Joint beliefs and the role of education

The aggregate pattern in the previous section masks meaningful heterogeneity across education. As Figure 1 (right panel) shows, the positive correlation hides sharply different belief patterns: households at different education levels associate inflation and unemployment in opposite ways. Among respondents without a college degree, the estimated Phillips correlation is positive; among college-educated respondents, expectations are consistent with a negative relationship between inflation and unemployment. These patterns are robust to a range of controls and to using qualitative rather than quantitative responses for priors and perceptions (Table 2).¹¹ The negative correlation among more educated households is consistent with a textbook view of the monetary policy trade-off.

Interpreting these correlations requires a benchmark. The sign of the inflation - unemployment relationship depends on the shocks driving the economy: a negative correlation is

⁹Figure A2 in Appendix A shows the correlation between prior expectations for inflation, unemployment, and mortgage rates. While the correlations across all three items are high, consistent with Weber et al. (2022), the figures reveal substantial dispersion, particularly for inflation.

¹⁰See Figure A3 in Appendix A for the raw, non-binned scatter plot.

¹¹Table A3 in Appendix A shows that the results are robust to additional controls, including asset ownership, borrowing status, political orientation, and field of study.

not unconditionally correct, nor a positive one unconditionally wrong. To assess whose beliefs are more consistent with prevailing macroeconomic conditions, we compare household expectations with those of professional forecasters. We use the individual twelve-month-ahead forecasts of unemployment and HICP inflation from the 2024Q2 wave of the ECB Survey of Professional Forecasters (SPF). The SPF does not collect perceptions (nowcasts), so we approximate expected changes by subtracting the values of inflation and unemployment observed in 2024Q2, under the assumption that forecasters observe current conditions. Replicating our baseline analysis on these data yields a negative and statistically significant inflation–unemployment coefficient.¹² College-educated households thus perceive the inflation - unemployment trade-off in a manner consistent with professional forecasters.¹³

4 Beliefs conditional on a monetary policy shock

So far, we have documented that the sign of the inflation–unemployment correlation differs across education levels. This may hint that respondents hold different mental models and therefore give different answers. Indeed, the sign of the correlation also depends on which shock respondents have in mind: the Phillips logic is consistent with either sign—a negative inflation–unemployment correlation if they have a demand shock in mind, and a positive correlation if they expect a supply shock. Observing a positive correlation among less-educated respondents therefore need not indicate inconsistency with standard macroeconomic models; it may instead reflect a supply-driven narrative, different from the demand-driven view held by more-educated respondents.

To investigate this, we turn to *conditional* expectations formed in response to a hypothetical monetary policy shock. This shift offers two advantages. First, conditioning on an explicit shock places all respondents in a common, clearly defined scenario with a comparable information set, so that differences in beliefs reflect their subjective models rather than information frictions, such as differing information sources or news exposure. Second, by comparing these conditional expectations with the unconditional ones elicited at the start of the survey, we can net out components of beliefs that reflect partially anticipated developments rather than genuine responses to the shock.

We implement this approach through a monetary policy vignette: interest rate changes provide a tractable, policy-relevant shock that connects directly to inflation, real activity, and financial conditions.

¹²See Figure A4 in Appendix A.

¹³Our evidence need not conflict with findings of a flat Phillips curve in aggregate data. Beliefs may reflect theoretical knowledge of core macroeconomic trade-offs rather than recent outcomes. Moreover, most evidence of flattening predates the pandemic, while recent work documents a steepening during the 2021–2023 inflation episode (Cerrato and Gitti, 2025, Giannone and Primiceri, 2024). Beliefs in a Phillips curve that is “alive and well” may thus reflect both theoretical reasoning and recent experience.

4.1 Vignette

How do households change their beliefs about the macroeconomic environment in response to a monetary policy shock? We address this question by presenting a hypothetical scenario, a “vignette,” that simulates an unexpected policy move by the European Central Bank, and recording respondents’ beliefs about the one-year-ahead values of inflation, unemployment, and stock prices. The vignette reads as follows:

“Imagine that the European Central Bank unexpectedly raises (lowers) interest rates from 4.5% to 5% (4.0%). No other major economic events occur at the same time.”

The shock described in the vignette satisfies Ramey (2016)’s criteria for identifying macroeconomic shocks: exogeneity, unexpectedness, and relevance. Exogeneity is ensured by explicitly stating that the rate change occurs in the absence of any other major economic developments, which prevents respondents from attributing the policy move to concurrent events. Unexpectedness is conveyed by framing the move as unanticipated; we later assess the plausibility of this assumption by comparing the described rate change to respondents’ interest-rate expectations measured at the start of the survey. Relevance is established through the magnitude of the shock: a 50-basis-point change in the policy rate corresponds to roughly seven standard deviations of the typical monetary policy shock in euro-area data.¹⁴ At the same time, this magnitude remains within the range of historically observed ECB moves.¹⁵ Overall, the vignette exposes respondents to a policy shock large enough to trigger a sizable response, yet realistic enough to be perceived as credible.

To capture potential asymmetries in belief formation, we randomly assign respondents to one of two treatments: half face a hypothetical increase in the policy rate of 50 basis points, the other half a hypothetical decrease of the same magnitude. In both cases, the pre-shock rate is set at 4.5%, matching the European Central Bank’s main refinancing operations rate in May 2024, when the survey was conducted.

The vignette is followed by questions on three macroeconomic indicators:

“What do you think inflation/unemployment will be in 12 months if this event happened today?”

“How do you think the prices of stocks in the stock market would react? Increase / Decrease / No change.”

We label households’ responses to the vignette as “posteriors,” since they represent beliefs formed *after* exposure to the hypothetical monetary policy shock, and we contrast them with households’ priors, the beliefs formed *before* the vignette. Because the only new information households receive when updating from priors to posteriors is the policy change described

¹⁴For example, estimating a medium-scale VAR using year-on-year CPI inflation and unemployment (our variables of interest) yields a median standard deviation of identified monetary policy shocks of about 7 basis points, consistent with estimates reported by Jarociński and Karadi (2020).

¹⁵Figure A5 in Appendix A shows the distribution of policy-rate changes since 1999, confirming that a 50-basis-point adjustment is well within the empirical record.

in the vignette, the difference between posterior and prior beliefs reveals how households evaluate the effect of a monetary policy shock on future inflation and unemployment; that is, it captures the impulse responses of households' beliefs for these two variables.

Formally, we compute households' beliefs about the responses of inflation and unemployment to the shock, which we call subjective impulse responses (SIRs), as follows:

$$SIR_{z,t+1,\delta}^i = \underbrace{\mathbb{E}^i[z_{t+1}|\tilde{\mathcal{I}}_t]}_{\text{Posterior}} - \underbrace{\mathbb{E}^i[z_{t+1}|\mathcal{I}_t]}_{\text{Prior}}, \quad \tilde{\mathcal{I}}_t = \{\mathcal{I}_t\} \cup \{\varepsilon_t = \delta\}$$

where $z \in \{\pi, u\}$ and δ is the size of the shock ε_t to the interest rate.

4.2 Subjective impulse responses and mental models

What mental models do households use to assess the effects of a monetary policy shock like the one in our vignette? To address this, we classify respondents by the joint signs of their subjective impulse responses for inflation and unemployment.¹⁶ Since a symmetry test reveals no significant asymmetry, we reverse the sign of the responses under monetary easing and refer to the shock as a monetary tightening from here on.¹⁷ We then map these sign combinations, where possible, onto known macroeconomic frameworks. Figure 2 shows the distribution across groups.¹⁸

First, 14% of respondents display SIR signs consistent with standard New Keynesian DSGE models, which predict a temporary decline in inflation and a contraction in real activity following a monetary tightening (see, e.g., Smets and Wouters, 2007). We call this the *textbook* group.

A combination of rising inflation and rising unemployment is reported by 24% of the sample. These beliefs align with cost-channel models, in which higher interest rates raise firms' marginal costs through working-capital requirements or cash-in-advance constraints (e.g., Barth and Ramey, 2001, Christiano et al., 2005). An alternative reading is the cost-of-living hypothesis of Bolhuis et al. (2024), which links higher mortgage rates to higher inflation perceptions and more pessimistic labor-market expectations. We classify these households as the *cost-channel* group.

A smaller group, 9% of respondents, expects a monetary tightening to raise both inflation and economic activity. These responses are consistent with information-channel models, in which agents read a tightening as a signal of central bank confidence about future conditions (e.g., Campbell et al., 2012, Nakamura and Steinsson, 2018, Jarociński and Karadi, 2020). We label this the *information-channel* group.

¹⁶The distributions of the subjective impulse responses are shown in Figure A6 in Appendix A.

¹⁷Table A4 in Appendix A tests for symmetric effects of positive and negative shocks and finds no evidence of asymmetry.

¹⁸The probability of being assigned to each category under random guessing is derived in Appendix B. The empirical frequencies in our data differ substantially from these benchmarks, indicating that respondents are not simply guessing at random.

Overall, about 47% of respondents give answers interpretable within the sign structure of well-established models, whether textbook, cost-channel, or information-channel.

How about the remaining respondents? 9% expect both inflation and unemployment to fall after an unexpected increase in the policy rate. This negative comovement is uncommon in monetary models, so we label these households *residual*.¹⁹

Close to 44% of respondents display some degree of expectational inertia in response to the shock; we label them *stubborn*. In the full sample, 20% expect inflation not to react and 31% expect unemployment not to react, while 8% expect neither variable to adjust; we call this last group *super stubborn*. This is in line with Binetti et al. (2024), who also document households’ reluctance to revise their beliefs after a policy-rate change.²⁰

Households’ beliefs about stock prices provide us with an additional sign restriction that helps refine our mental-model classification. We therefore examine how households expect the stock market to respond to a monetary policy shock, and whether these views are consistent with the interpretative models in Figure 2.

Figure 3 reports the expected direction of the stock-price change after an unexpected rate hike. Most respondents (49%) expect a fall, consistent with standard frameworks in which higher rates depress asset prices through higher discount rates and weaker expected cash flows. A further 33% expect a rise, in line with the information-channel view, and 18% expect no effect. As with inflation and unemployment, views on financial markets are heterogeneous across households.

We use these beliefs to refine the link between SIRs and interpretative models at the household level.²¹ By construction, all three shares fall: most sharply for the information-channel group (to 3.57% from 9.41%), and substantially for the textbook (to 7.44% from 13.81%) and cost-channel (to 13.58% from 24.13%) groups. We then work with these selected households, together with the residual, stubborn, and super-stubborn groups identified earlier, to assess the role of education.

4.3 Mental models: the role of education

Having shown that education mediates how households form unconditional macroeconomic expectations, we next ask whether it also matters for how they interpret monetary policy scenarios. We test whether more educated individuals are more likely to be classified into

¹⁹Few standard mechanisms rationalize a negative inflation - unemployment comovement after a monetary tightening. Search-theoretic models, in which lower inflation raises real balances and can reduce unemployment (Lagos et al., 2017), usually imply a positive short-run correlation among policy rates, inflation, and unemployment. The new-Fisherian view allows higher nominal rates to be expansionary and inflationary (Cochrane, 2017), but only for gradual, persistent, and anticipated changes, unlike our immediate, unexpected shock. An information effect (the tightening signaling a positive productivity shock) is also implausible, since the ECB’s inflation-focused mandate would imply lower, not higher, rates.

²⁰In Appendix B, we show that the prevalence of stubborn respondents is not driven by prior anticipation of the vignette shock: respondents who expected a rate change similar in size and sign to the one described are no more likely to exhibit belief inertia than those who did not.

²¹Table 3 reports the shares of the three theory-consistent groups (textbook, cost-channel, information-channel) that “survive” once we jointly impose the sign restrictions on the impulse responses of inflation, unemployment, and stock prices.

the mental models identified above. For each mental model m , we estimate the linear probability model

$$y_{i,m} = c_m + \beta_m x_i + \alpha'_m Z_i + \gamma'_m W_i + u_{i,m} \quad (1)$$

where $y_{i,m}$ equals one if household i is classified under mental model m and zero otherwise; x_i equals one if the household's education is above the median (16 years, i.e., college or above); Z_i collects individual characteristics (age, gender, marital status, number of children, net income, employment status, and homeownership); and W_i collects survey-related variables: the sentiment response, the placebo-vignette score,²² the randomization group, and the expected change in the mortgage rate (the difference between prior and perceived values), which accounts for any anticipation of the vignette shock.

The top panel of Figure 4 reports the estimated coefficients β_m , our object of interest. Higher education is associated with a 2.8-percentage-point higher probability of interpreting the macroeconomy through a textbook model (51% above the low-education baseline) and a 4.3-percentage-point higher probability of using a cost-channel framework (37% above baseline).²³ The estimated coefficient for the information-channel group is negative. Higher education is also associated with a 3.9-percentage-point lower probability of falling in the residual category (36% below the low-education baseline), and with a lower probability of being classified as stubborn, though this last coefficient is not statistically significant. Overall, higher education is associated with interpreting the economy in a theory-consistent way—through a textbook AD/AS model or a cost-channel framework—while non-standard beliefs about the macroeconomic effects of monetary policy are more common among less-educated households.

These results are robust to several checks. First, we estimate a multinomial probit in place of the linear probability model (Figure 4, bottom panel). Second, we augment equation (1) with controls for economic, financial, and ideological circumstances: asset ownership, borrowing status, self-employment, political orientation, and field of study.²⁴ Finally, we use a less restrictive classification based only on the SIRs of inflation and unemployment, without the stock-market response.²⁵

4.4 Narratives and education: evidence from open-ended questions

Beyond the sign patterns of SIRs, we ask whether education also shapes the *reasoning* households use when thinking about the consequences of monetary policy—that is, their economic narratives. We exploit the open-ended questions from the second wave, in which

²²We construct the score as described in Section 5.

²³Table 4 compares the high-education coefficient with the probability of group membership among low-education respondents, expressing the association relative to that baseline.

²⁴See Figure A7 in Appendix A. In this extended specification, more-educated respondents remain significantly less likely to belong to the residual group. Because some background variables are available only for a subset of respondents, the specification is estimated on a smaller sample and may be noisier, particularly for asset-related responses.

²⁵See Figure A8 in Appendix A.

respondents were once again presented with the same vignette as in the main survey and described, in their own words, the causal logic behind their expected changes in inflation and unemployment. We classify these free-text responses with an LLM-based algorithm, validated against human coding, that assigns each answer to one of several narrative categories derived inductively from the responses.²⁶ The categories mirror the mental-model taxonomy of Section 4.2: a *textbook* narrative, in which higher rates reduce demand and so cool inflation while weakening the labor market; a *cost-channel* narrative, in which higher rates raise firms’ financing costs, pass through to prices, and slow hiring; a *positive-signal* narrative, consistent with the information channel; an *other* category for narratives with a clear causal mechanism that do not map onto any model considered; and a *residual* category for generic statements that describe outcomes without a mechanism, as well as uninformative responses.

The results, reported in Figure 5, mirror the SIR evidence and reinforce the role of education. More-educated respondents are significantly more likely to give narratives consistent with the textbook or cost-channel model, the same two frameworks into which their SIR sign patterns in the first wave were most often classified. Less-educated respondents are instead over-represented in the residual category, describing macroeconomic outcomes without articulating a mechanism or giving uninformative answers. The positive-signal and other categories show no significant association with education. The open-ended evidence is thus consistent with the SIR-based findings and adds to them: education is associated not only with the *direction* of belief updating but also with how well-structured the underlying economic reasoning is.

4.5 Actions and education

How do households adjust their spending and saving in response to a monetary policy shock? Our survey asks respondents what they would do under the vignette scenario: increase, decrease, or leave spending and saving unchanged. We estimate linear probability regressions in which the dependent variable is an indicator equal to one if the respondent takes a particular action (e.g., increasing spending), and the regressors are the controls listed above together with an indicator for highly educated respondents.²⁷

Figure 6 reports the education coefficients. Higher education is associated with a higher probability of increasing saving and reducing spending after a monetary tightening, consistent with the intertemporal substitution channel of monetary policy transmission, in which higher interest rates raise the return to saving and make delayed consumption more attractive. The differences are sizable: relative to less-educated households, the more educated are 6.4 percentage points less likely to reduce saving and 4.2 percentage points less likely to increase spending. Because the regressions control for income and housing tenure, this

²⁶See Appendix E for details.

²⁷Controls also include the prior expected change in the mortgage rate, which accounts for any anticipation of the vignette shock.

association is not explained by households’ personal economic circumstances.

To understand the reasoning behind these choices, we again use the open-ended questions from the second wave, in which respondents explain in their own words why they would behave as indicated. Using the same LLM classification approach (see Appendix E), we code responses by the economic reasoning they contain. One category captures the substitution effect: the recognition that higher rates raise the return to saving and make delayed consumption more attractive, the logic behind the standard prediction of more saving and less spending after a tightening. More educated respondents are significantly more likely to invoke this substitution-effect reasoning.²⁸

These patterns may carry welfare implications. Lower education tends to coincide with lower income and wealth, so responses that depart from the standard intertemporal-substitution prediction are concentrated among the households with the least buffer against adverse shocks. This is consistent with Lusardi and Mitchell (2014, 2023), who link the financial choices of less financially literate households to worse outcomes.

5 What lies behind the education gradient?

Why does education emerge as such a robust dimension of heterogeneity in how households understand the macroeconomy and interpret monetary policy? Education is correlated with many household features—economic exposure and incentives to stay informed, the information sources households use, financial literacy, formal training in economics, and trust in institutions—any of which could be the salient channel behind the patterns documented above. Then, to investigate what lies behind the education gradient, we proceed in two steps. First, we present evidence that more-educated respondents have stronger ability to interpret, filter, and internally discipline complex or hypothetical economic scenarios—which we infer from the placebo vignette and related measures. Second, we show that accounting for the observable features correlated with education, individually or jointly, does not eliminate the gradient.

The evidence indicates that no single observable feature fully accounts for the patterns documented earlier. Education is instead associated with how households process and structure macroeconomic information, generating persistent differences that go beyond what people know, where they obtain it, or how financially exposed they are.

5.1 Abstract reasoning and education

A natural interpretation of the education gradient is that education strengthens the ability to reason abstractly about economic mechanisms and to separate relevant from irrelevant information, drawing on skills such as abstraction, internal consistency, and disciplined causal reasoning that are central to interpreting macroeconomic relationships. We test this directly with a placebo vignette.

²⁸See Figure A9 in Appendix A.

Before the monetary policy vignette, respondents see a short description of a plausible-sounding but economically irrelevant shock:

“The Netherlands does not import copper from Australia. Imagine a new copper mine being discovered in Australia.”

They are then asked how this event would affect firms’ costs, household expenditure, consumer prices, and unemployment in the Netherlands. Because the shock is economically irrelevant for the Dutch economy, the correct response is to recognize its irrelevance and refrain from spurious causal extrapolation.²⁹

We construct a placebo score from 0 to 4, awarding one point for each “no change” response. For firms’ costs and consumer prices, we also award a point for a “down” response, since a general-equilibrium view (a global adjustment of the copper market that lowers input costs and prices) could justify it.³⁰

Table 5 shows that the placebo score is positively and significantly associated with educational attainment. More-educated individuals are thus better able to interpret hypothetical scenarios and filter out irrelevant information. These reasoning skills are directly relevant for understanding macroeconomic shocks and offer a natural explanation for why education is associated with more theory-consistent belief updating in response to monetary policy.

5.2 Economic exposure

Individuals with higher education may have stronger incentives to understand macroeconomic dynamics, since their personal financial situations make them more exposed to these forces. Higher educational attainment tends to come with higher lifetime income, greater asset accumulation, and more complex intertemporal choices, all of which raise the gains from tracking inflation, interest rates, and macroeconomic policy.³¹

Our data are consistent with this mechanism: more-educated respondents are significantly more likely to own a home, hold financial assets, and carry private insurance, controlling for standard sociodemographic characteristics.³² Their greater exposure to macroeconomic fluctuations, particularly inflation and interest-rate movements, gives them stronger incentives to follow macroeconomic conditions. Differential exposure nonetheless cannot account for our main findings: the education gradient in both the unconditional belief correlations and the conditional policy responses persists when we control for asset holdings,

²⁹The Netherlands does trade copper ore, but the magnitudes are small: in 2022, imports (exports) amounted to 0.25% (0.15%) of real GDP, making the country the 27th largest importer and the 80th largest exporter worldwide. By comparison, Dutch imports (exports) of refined petroleum were 5.10% (6.80%) of GDP that year. Source: Observatory of Economic Complexity (OEC), <https://oec.world/en/profile/bilateral-product/copper-ore/reporter/nld>.

³⁰Figure A10 in Appendix A shows substantial heterogeneity in performance, with all possible scores observed.

³¹Consistent with this view, Calvet et al. (2009) show that better-educated Swedish households are more likely to participate in the stock market and hold more diversified portfolios, achieving lower idiosyncratic risk conditional on participation.

³²Figure A11 in Appendix A reports these estimates.

insurance status, and related measures of financial exposure.³³ Education therefore does not merely proxy for the private returns to being informed, pointing to mechanisms beyond incentives alone.

5.3 Information sources

Education might matter because it sorts individuals into different information environments. If more-educated households rely on higher-quality or more informative sources, the heterogeneity in beliefs could reflect differences in informational inputs rather than in how those inputs are interpreted.

Education is indeed strongly associated with the choice of information source: more-educated respondents are far more likely to cite newspapers and economic knowledge (from formal or informal learning) when forming inflation expectations, while less-educated respondents rely more on social media.³⁴ Sorting alone, however, cannot explain the education gradient. Estimating the Phillips correlation separately within each source group, we find that more-educated respondents display a negative correlation and less-educated respondents a positive one across all sources, including newspapers, economic knowledge, and social media; the pattern is noisier in smaller subsamples but qualitatively stable.³⁵

Unlike existing evidence that focuses on inflation expectations alone (D’Acunto et al., 2025), our results concern the understanding of macroeconomic relationships, for which exposure to the same source need not produce a common interpretation. Even among respondents reporting the same source, education remains strongly associated with how macroeconomic relations are mapped, suggesting that it operates mainly through how information is processed and structured rather than how it is acquired.

5.4 Education versus financial literacy

We assess whether education merely proxies for financial literacy, which the household finance literature identifies as a key determinant of financial decision-making (Calvet et al., 2009, Lusardi et al., 2017). Education and financial literacy are strongly correlated (Lusardi and Mitchell, 2014, 2023), but they need not capture the same underlying capabilities.

Using the second wave, we measure financial literacy with four standard questions on compound interest, inflation, risk diversification, and the time value of money. As expected, financial literacy increases with educational attainment (Table 6), consistent with evidence that households facing more complex saving and portfolio decisions invest more in financial knowledge (Lusardi et al., 2017, Lusardi and Mitchell, 2023). Yet including financial literacy in our main regressions leaves the education gradient in macroeconomic reasoning essentially unchanged: controlling for financial literacy does not attenuate the negative Phillips correlation among highly educated respondents (Table 7). Financial literacy itself

³³See Table A3 (unconditional correlations) and Figure A7 (conditional responses), both in Appendix A.

³⁴See Figure A12 in Appendix A.

³⁵Figure A13 in Appendix A summarizes the results.

is not associated with comparable heterogeneity; while it increases the likelihood of being in the textbook group, it does not account for the full pattern across interpretative types.³⁶

Taken together, financial literacy and education are related but not interchangeable. Education appears to capture broader abilities, such as abstraction, internal consistency, and the interpretation of aggregate economic relationships, that are essential for understanding macroeconomic shocks but are not well measured by standard financial-literacy indicators.

5.5 Formal training in economics

A natural hypothesis is that the role of education in macroeconomic beliefs is driven primarily by formal training in economics. We investigate this using the detailed information on educational attainment in our data, which includes respondents' fields of study: we construct an indicator equal to one for individuals who majored in economics in their most recent degree and ask whether this background accounts for our key results.³⁷

We find no support for this hypothesis. Respondents with an economics background do not differ significantly from others in their beliefs about the Phillips correlation, nor does economics training interact significantly with educational attainment (Table 8). The same holds for assignment to interpretative groups in the monetary policy vignette: economics training shows no systematic differences.³⁸

Overall, the education gradient we document is not driven by specialized training in economics, but by broader skills or traits associated with general educational attainment.

5.6 Trust in institutions

Finally, differences in macroeconomic reasoning could reflect differences in engagement and effort rather than in understanding alone. More-educated individuals may be more inclined to trust institutions, to view surveys as meaningful, and to exert greater cognitive effort on complex questions.

To explore this we use the LISS "Political Values" module, which measures confidence in a broad set of institutions, including government, parliament, the legal system, political parties, the media, science, the economy, and democracy. More educated respondents consistently report higher trust across all domains.³⁹ This suggests that education may be associated with greater civic engagement and survey effort, which could contribute to more structured and internally coherent responses. This channel is unlikely to fully explain the education gradient documented throughout the paper, but it may reinforce the role of education in belief formation.

³⁶Figure A14 reports respondents' performance on the financial literacy questions. Figures A15 and A16 in Appendix A present the estimated effects of education and financial literacy, respectively, on the probability of belonging to the different mental model groups.

³⁷We treat economics degrees as including majors in economics, management, business administration, and accounting. Appendix C discusses exposure to economics teaching in the Dutch schooling system.

³⁸These estimates are reported in Figure A17 in Appendix A.

³⁹Figure A18 in Appendix A reports regression coefficients of institutional trust on education and our standard controls, estimated separately for each institution.

6 Conclusions

This paper studies how education shapes households’ understanding of macroeconomic relationships and their interpretation of monetary policy. Our central finding is that more educated households hold more theory-consistent beliefs, in both unconditional and conditional data. Respondents without a college degree, display the familiar positive inflation - unemployment correlation, consistent with a supply-side narrative; college-educated respondents show a negative correlation, in line with the monetary-policy trade-off and professional forecasts. After an unexpected monetary policy shock, the more educated update beliefs in ways consistent with standard mechanisms (textbook and cost-channel), while the less educated fall disproportionately into non-standard types. The same gap appears in behavior: the more educated are more likely to save more and spend less after a tightening, the less educated often the opposite.

These patterns have modeling and policy implications. For modeling, they motivate frameworks that build in education-related heterogeneity. Because education is closely tied to economic exposure and portfolio complexity (Kaplan et al., 2014), one avenue is to model financial knowledge as an endogenous human-capital investment, providing micro-foundations for rule-of-thumb behavior in two-agent models (e.g., Galí et al., 2007, Bilbiie, 2025, Debortoli and Gali’, 2025) and for poor and wealthy hand-to-mouth households in HANK models (e.g., Kaplan et al., 2018, Auclert, 2019, Acharya et al., 2023, Auclert et al., 2024). A complementary route is heterogeneous subjective models, combining a rational-expectations block with a supply-side belief block to aggregate heterogeneous behaviors coherently (Kamdar and Ray, 2024, Bhandari et al., 2024, Moll, 2026).

For policy, our results are consistent with the view that economic knowledge shapes how households interpret policy and translate it into spending and saving. Such heterogeneity can weaken monetary transmission (Baldassarri et al., 2024) and may widen wealth inequality (Lusardi and Mitchell, 2023).⁴⁰ This supports efforts to strengthen economic and financial education (Lusardi and Mitchell, 2023) and central banks’ moves to simplify communication and broaden outreach (e.g., Haldane and McMahon, 2018, Coibion et al., 2022, Blinder et al., 2024). Our evidence adds one caveat: the binding constraint is not only access to information but its interpretation. Even conditional on information sources, education remains strongly associated with theory-consistent reasoning.

⁴⁰Lusardi et al. (2017) estimate that consumers would give up about 3 percent of lifetime consumption to live in a world with perfect financial knowledge.

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Tables and Figures

Variable	Our Survey	DNB 2024
Gender (female)	50%	51%
Age (median)	56	52
Personal net income (in Euros, median)	2218	2447
Education (years, median)	16	16

Notes. Comparison between the distributions of individual characteristics in our survey and those in the Dutch National Bank Household Survey.

Table 1: LISS survey vs DNB survey

	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$
$\Delta \mathbb{E}u$	0.284** (0.118)	0.403*** (0.102)		
Education	-0.530*** (0.103)	-0.253** (0.109)	-0.240*** (0.0446)	-0.102** (0.0496)
Education=1 $\times$ $\Delta \mathbb{E}u$	-0.428** (0.169)	-0.496*** (0.165)		
$\Delta \mathbb{E}u$			0.151*** (0.0440)	0.162*** (0.0449)
Education=1 $\times$ $\Delta \mathbb{E}u$			-0.230*** (0.0712)	-0.246*** (0.0707)
Controls	N	Y	N	Y
R-squared	0.041	0.134	0.039	0.126
Observations	1318	1237	1318	1237
Variables	Numerical	Numerical	Categorical	Categorical

Notes. Numerical variables are defined as *Prior* – *Perception*. Categorical variables equal one if inflation/unemployment is expected to increase, zero if expected not to change, and minus one if expected to decrease. Controls include age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, and placebo. Huber–White standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 2: Joint beliefs on inflation and employment

models	π	u	sp	% with sp	% without sp
textbook	< 0	> 0	< 0	7.44%	13.81%
cost channel	> 0	> 0	< 0	13.58%	24.13%
info channel	> 0	< 0	> 0	3.57%	9.41%

Notes. Responses to unexpected policy easings are grouped together with those of policy tightenings. “% with sp” denotes the share of models that jointly satisfy the sign restrictions on the responses of inflation, unemployment, and stock prices (sp). “% without sp” denotes the share of models that satisfy the sign restrictions on inflation and unemployment only.

Table 3: Theory-consistent mental models and stock-price responses

Group	Effect of Education	E(Group Educ =0)	Variation (%)
Textbook	.028	.055	50.91
Cost Channel	.043	.117	36.75
Info Channel	-.024	.048	-50
Residual Model	-.039	.107	-36.45
Stubborn	-.003	.353	-.85
Super stubborn	-.012	.079	-15.19

Notes. Coefficients are from regressions of group-membership indicators (one for each interpretative model) on education and a common set of controls. For each group, we report (i) the estimated effect of high education; (ii) the baseline probability of group membership among respondents with low education; and (iii) the implied change in membership probability associated with high education, expressed relative to the baseline probability.

Table 4: Economic significance of education

	Placebo Score
Education above median	0.371*** (0.0911)
Controls	Y
R-squared	0.039
Observations	1237

Notes. The dependent variable is the placebo score (ranging from 0 to 4), which awards one point for each *no change* response; *down* responses for firms’ costs and goods’ prices are also counted as correct, consistent with general-equilibrium reasoning. Education is an indicator equal to one for respondents holding at least a college degree. Controls include gender, age, marital status, number of children, net monthly income, employment status, homeownership, and sentiment. Huber–White standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 5: Placebo score and education

	Interest rates	Inflation	Diversification	Time value
Education above median	0.049** (0.021)	0.099*** (0.021)	0.074*** (0.026)	0.184*** (0.034)
Controls	Yes	Yes	Yes	Yes
Observations	948	948	948	948
R-squared	0.028	0.076	0.024	0.084

Notes. Reported coefficients are from OLS regressions in which the dependent variable equals one if the respondent answered the corresponding financial-literacy question correctly. The main explanatory variable is an indicator equal to one for respondents holding at least a college degree. Controls include gender, age, marital status, number of children, net monthly income, employment status, homeownership, economic sentiment, and the placebo-vignette comprehension score. Huber–White standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 6: Education and financial literacy

	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$
$\Delta \mathbb{E}u$	0.323*** (0.0794)	0.311 (0.264)	0.298 (0.246)	0.140*** (0.0505)	0.197 (0.135)	0.190 (0.135)
Education	-0.0883 (0.126)	-0.148 (0.129)	-0.0880 (0.125)	-0.0667 (0.0568)	-0.0881 (0.0563)	-0.0677 (0.0569)
Education $\times$ $\Delta \mathbb{E}u$	-0.544*** (0.176)		-0.547*** (0.174)	-0.245*** (0.0789)		-0.238*** (0.0828)
Fin. Lit.	-0.327*** (0.0736)	-0.326*** (0.0716)	-0.329*** (0.0714)	-0.141*** (0.0271)	-0.135*** (0.0287)	-0.138*** (0.0287)
$\Delta \mathbb{E}u \times$ Fin. Lit.		-0.0553 (0.0846)	0.00830 (0.0774)		-0.0491 (0.0406)	-0.0161 (0.0428)
Controls	Y	Y	Y	Y	Y	Y
R-squared	0.160	0.146	0.160	0.161	0.152	0.161
Observations	948	948	948	948	948	948
Variables	Numerical	Numerical	Numerical	Categorical	Categorical	Categorical

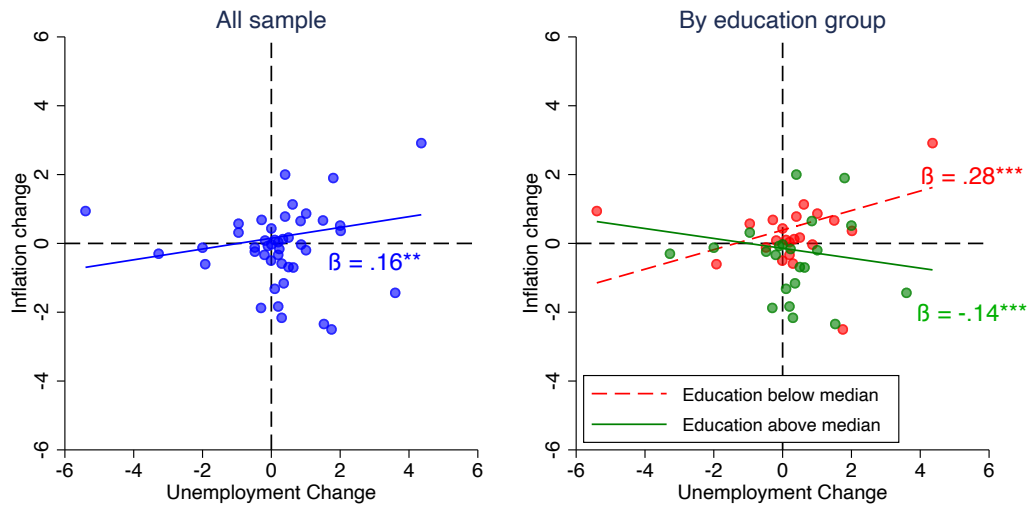
Notes. Reported estimates are from OLS regressions of expected inflation changes on expected unemployment changes, examining whether differences in education or financial literacy account for heterogeneity in the Phillips correlation. Financial literacy is measured by an indicator equal to one if the respondent answered all four financial-literacy questions correctly. Columns 1–3 use continuous measures of expected changes, while Columns 4–6 use categorical measures. Controls include gender, age, marital status, number of children, net monthly income, employment status, homeownership, economic sentiment, and the placebo-vignette comprehension score. Huber–White standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Education, financial literacy, and the Phillips correlation

	$\Delta \mathbb{E}\pi$	$\Delta \mathbb{E}\pi$
$\Delta \mathbb{E}u$	0.298*** (0.112)	0.477*** (0.109)
Field Economics	-0.236 (0.149)	-0.217 (0.148)
Field Economics $\times \Delta \mathbb{E}u$	-0.158 (0.190)	-0.200 (0.209)
Education above median		-0.252** (0.113)
Education above median=1 $\times \Delta \mathbb{E}u$		-0.582*** (0.205)
Education above median=1 $\times$ Field Economics $\times \Delta \mathbb{E}u$		0.146 (0.342)
Controls	Yes	Yes
R-squared	0.121	0.142
Observations	1172	1172

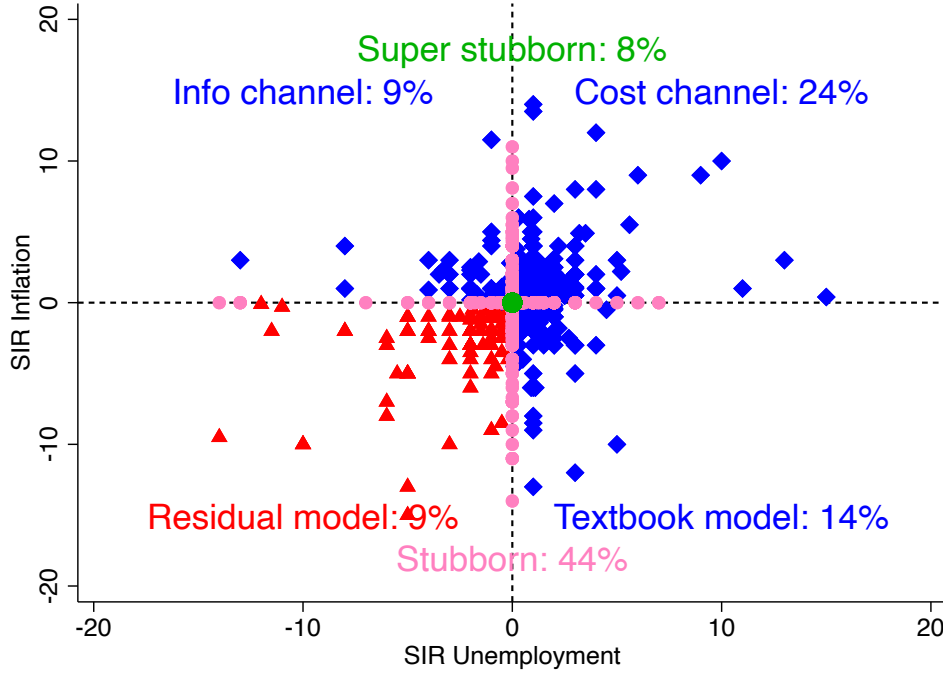
Notes. Reported estimates are from regressions of expected inflation changes on expected unemployment changes, where both variables are measured as *Prior* – *Perception*. *Field Economics* is an indicator equal to one if the respondent’s highest degree, regardless of level, is in economics, management, business administration, or accounting. Controls include age, gender, marital status, number of children, net income, employment status, homeownership, economic sentiment, and the placebo-vignette comprehension score. Huber–White standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 8: Phillips correlation and economics training



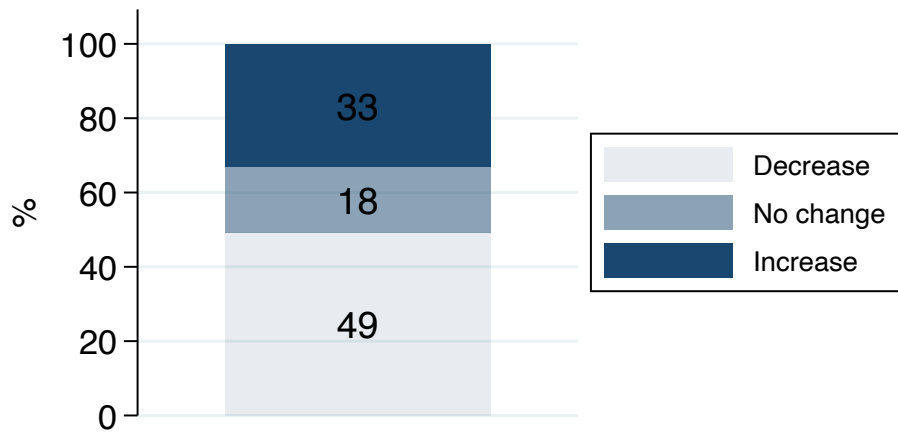
Notes. Correlation between households' expected changes in unemployment (x -axis) and expected changes in inflation (y -axis). The left panel pools all respondents; the right panel reports the correlation separately for respondents with below- and above-median years of education. Markers are binned scatter points. The fitted lines and the reported slopes β are estimated at the individual level from regressions of expected inflation changes on expected unemployment changes, controlling for age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, and a placebo control. Huber–White standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure 1: Phillips correlation and the role of education



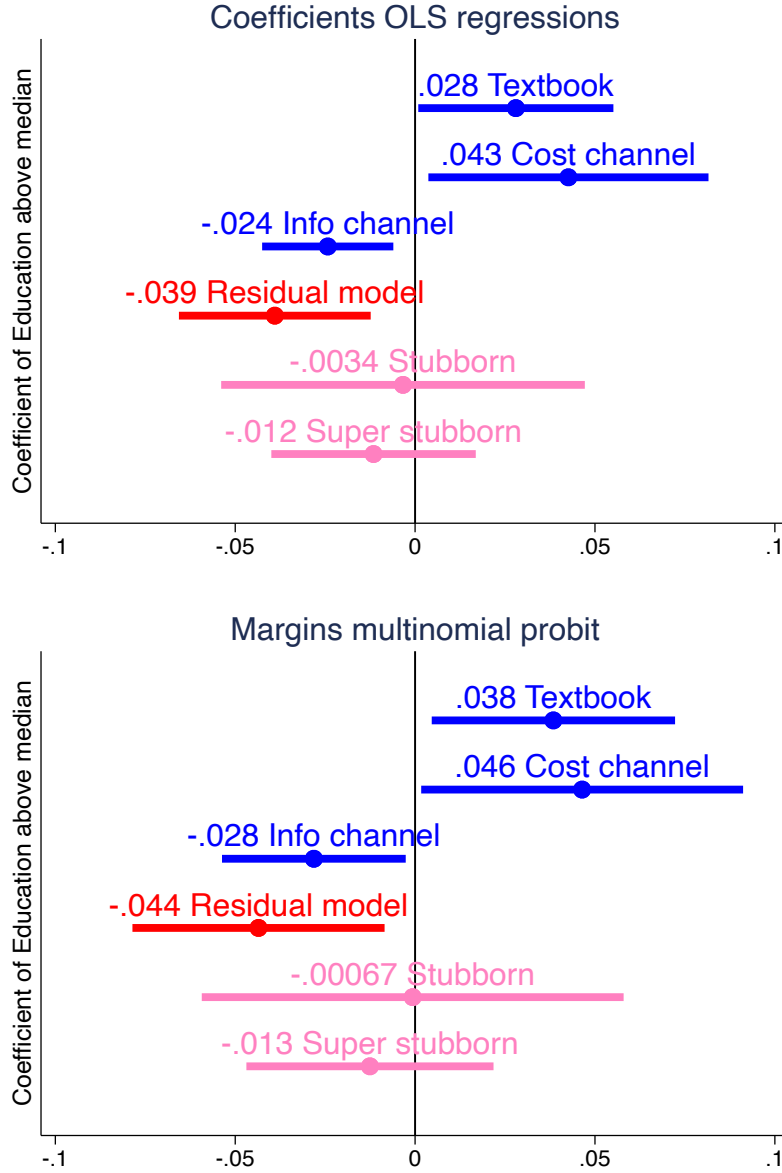
Notes. The horizontal and vertical axes report the numerical SIRs defined in Section 4.1 as the subjective impulse responses of unemployment and inflation to an unexpected monetary policy shock. Responses to unexpected policy easings are pooled with those to policy tightenings. Reported percentages are the shares of respondents whose SIR signs fall in the corresponding group. We define as stubborn all respondents with either $\text{SIR}u = 0$ or $\text{SIR}\pi = 0$ (44% of the sample). Within this group, 31% of respondents report $\text{sIRF}u = 0$ and 20% report $\text{sIRF}\pi = 0$. The super-stubborn subgroup (8% of the sample) consists of respondents with both $\text{sIRF}u = 0$ and $\text{sIRF}\pi = 0$.

Figure 2: Households' mental models



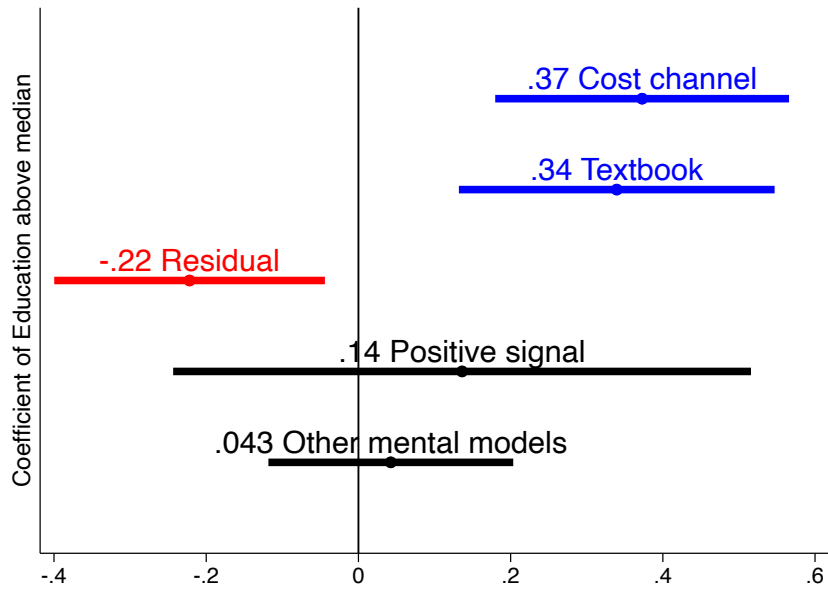
Notes. Responses to unexpected policy easings are pooled with those to policy tightenings.

Figure 3: Households' stock-price response



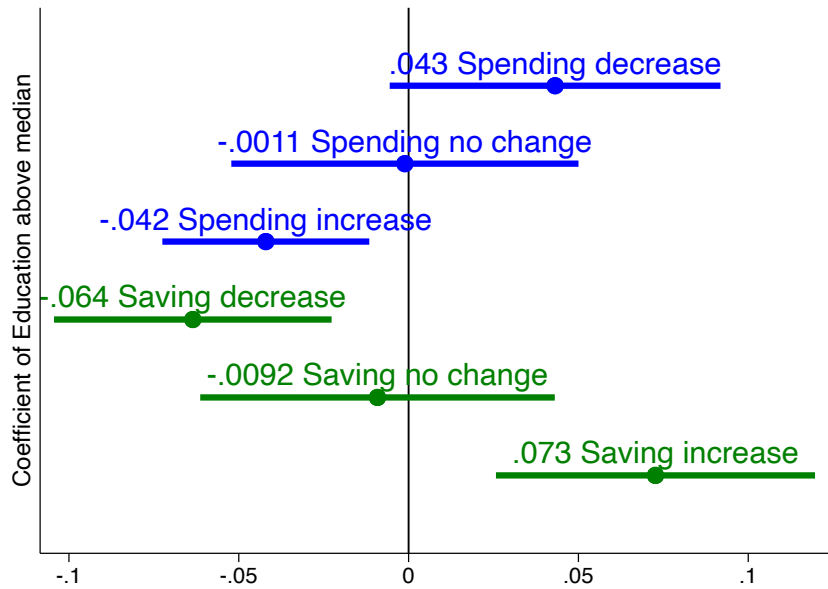
Notes. *Top panel:* OLS regressions with a dependent variable equal to one if the respondent is associated with a given mental model (defined in Figure 2 and based on the stock-price sign restrictions in Table 3) and zero otherwise, estimated one model at a time. *Bottom panel:* multinomial probit with a categorical dependent variable taking values 1 (Stubborn), 2 (Super stubborn), 3 (Textbook), 4 (Cost channel), 5 (Info channel), and 6 (Residual). Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo, randomization group, and expected change in mortgage rates (priors – perceptions). Huber–White standard errors.

Figure 4: Mental models and the role of education



Notes. Probit coefficients of the high-education indicator from regressions in which the dependent variable is an indicator for belonging to each mental-model group, defined from the LLM-based classification of the open-ended questions as reported in Appendix E. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, and economic sentiment. Huber–White standard errors.

Figure 5: Mental models and education based on open-ended questions



Notes. OLS regressions with a dependent variable equal to one if the respondent chooses a given action and zero otherwise, estimated one action at a time. The figure reports the coefficient on “education above median” in each regression. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo, randomization group, and expected change in mortgage rates (priors – perceptions). Huber–White standard errors.

Figure 6: Spending and saving and the role of education

Online Appendices

Appendix A Additional Tables and Figures

Variable	Paper sample	Matched
How many	1318	1006
Gender (female)	49%	49%
Age (median)	57	59
Personal net income (in Euros, median)	2250	2250
Education (years, median)	16	16
High education	43%	43%
Randomization	51%	52%

Notes. Comparison of key demographic characteristics between the sample of the main survey in May 2024 and the matched sample of the second survey in August 2025. The matched sample consists of 1,006 individuals, selected using the same data-cleaning criteria as the main survey.

Table A1: Representativeness of the matched sample

	N	Mean	SD	Min	Max
<i>Baseline controls</i>					
Gender: female	1316	0.490	0.500	0	1
Age	1318	53.945	15.788	18	84
Married	1318	0.547	0.498	0	1
N. children	1318	0.657	1.055	0	6
Personal net monthly income	1240	2215.709	1298.135	0	10500
Is employed	1317	0.550	0.498	0	1
Is unemployed	1317	0.018	0.134	0	1
Is out labor force	1317	0.431	0.495	0	1
Homeownership	1317	0.726	0.446	0	1
Sentiment future	1318	2.803	0.991	1	5
Sentiment peers	1318	3.041	0.910	1	5
Placebo score	1318	2.941	1.488	0	4
<i>Additional controls (LISS Core)</i>					
Financial assets	1241	0.181	0.385	0	1
Political views	1157	5.358	2.298	0	10
Borrower	1262	0.624	0.484	0	1
Self employed	1317	0.054	0.226	0	1
Study economics	1247	0.168	0.374	0	1
Has insurance	1241	0.110	0.313	0	1
Has mortgage	623	0.803	0.398	0	1
<i>Financial literacy</i>					
Financial literacy score	1006	3.226	0.914	0	4
<i>Expectations and perceptions</i>					
Inflation expectations	1318	5.175	3.672	0	15
Inflation perceptions	1318	5.002	3.142	0	12
Int rates expectations	1318	4.242	1.444	0	8
Int rates perceptions	1318	3.827	1.253	0	7
Unemployment expectations	1318	5.395	3.270	0	15
Unemployment perceptions	1318	5.252	3.207	0	15
<i>Subjective Impulse Response</i>					
SIR unemployment	1318	0.229	2.346	-14	15
SIR inflation	1318	0.330	2.919	-15	14
<i>Mental model groups</i>					
Textbook group	1318	0.074	0.262	0	1
Cost channel group	1318	0.136	0.343	0	1
Residual group	1318	0.086	0.280	0	1
Info channel group	1318	0.036	0.186	0	1
Stubborn group	1318	0.364	0.481	0	1
Super stubborn group	1318	0.077	0.266	0	1

Table A2: Summary statistics

	$\Delta \mathbb{E} \pi$
$\Delta \mathbb{E} u$	0.344*** (0.0868)
Education above median	-0.147 (0.130)
Education above median $\times \Delta \mathbb{E} u$	-0.467** (0.189)
Financial assets	-0.384** (0.155)
Political views	0.00630 (0.0281)
Borrower	0.0964 (0.123)
Self employed	-0.157 (0.256)
Study economics	-0.234 (0.165)
Standard Controls	Yes
R-squared	0.121
Observations	991

Notes. Regression of the expected change in inflation on the expected change in unemployment (*Prior* – *Perception*). Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo. Huber–White standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table A3: Phillips correlation and education - robustness

	SIR inflation	SIR unemployment
Tightening vignette	-0.00560 (0.0500)	0.00137 (0.0329)
Controls	Y	Y
R-squared	0.007	0.028
Observations	766	822

Notes. Dependent variable: the subjective impulse response (SIR) of inflation (column 1) and of unemployment (column 2), obtained by reversing the sign of responses under monetary easing. We trim the tails of both distributions (below the 16th and above the 84th percentile) to limit the influence of outliers. Regressor of interest: an indicator equal to one if the respondent was randomly assigned to the tightening vignette. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo. Huber–White standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table A4: Test for symmetry

	Inflation	Unemployment	Mortgage rates
Mean	5.175	5.395	4.242
Median	4	4.5	4
Mode	3	5	4
Variance	13.49	10.69	2.09
Skewness	1.292	1.614	.70
Kurtosis	3.946	5.385	4.324
Normality test p-value	0	0	0
DNB's estimate	2.8	4	Not available
Difference test pvalue	0	0	Not available

Notes. Moment comparison across macroeconomic indicators for households' one-year-ahead expectations. DNB: Dutch National Bank estimates. Normality test: Shapiro–Wilk test. Difference test: *t*-test comparing the mean of households' densities with the DNB estimate (null hypothesis: equality).

Table A5: Prior expectations

	stubborn	stubborn	stubborn	stubborn
Dummy Surprise=0	0.013 (0.052)			
Dummy Surprise∈[-1,1]		0.009 (0.052)		
Dummy Surprise∈[-10,10]			-0.004 (0.051)	
Dummy Surprise∈[-25,25]				-0.022 (0.039)
R-squared	0.000	0.000	0.000	0.000
Observations	1318	1318	1318	1318

Notes. The dependent variable is an indicator equal to one if the respondent is classified as *stubborn*, i.e., if at least one impulse response (inflation or unemployment) to the monetary policy shock is reported as zero. The main regressor is the surprise implied by the vignette, defined as the absolute difference between the vignette shock (± 0.5 percentage points) and the respondent's expected change in the mortgage rate, $\Delta \mathbb{E}r$ (the difference between their unconditional expectation and their perception of the current rate, both elicited at the start of the survey). The columns use indicators equal to one if the surprise is exactly zero (column 1) or falls within increasingly wide intervals around zero (columns 2–4: ± 1 , ± 10 , ± 25 basis points), testing whether respondents who anticipated the shock are more likely to be stubborn. Huber–White standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table A6: Test for shock unexpectedness

Consumer sentiment questions

Mortgage interest rates

Inflation

Unemployment

- Perceptions: now vs. 12 month ago (qualitative + point estimate)
- Expectations: in 12 months time vs. now (qualitative + point estimate)
- Importance for personal economic situation
- Sources of information

Placebo vignette

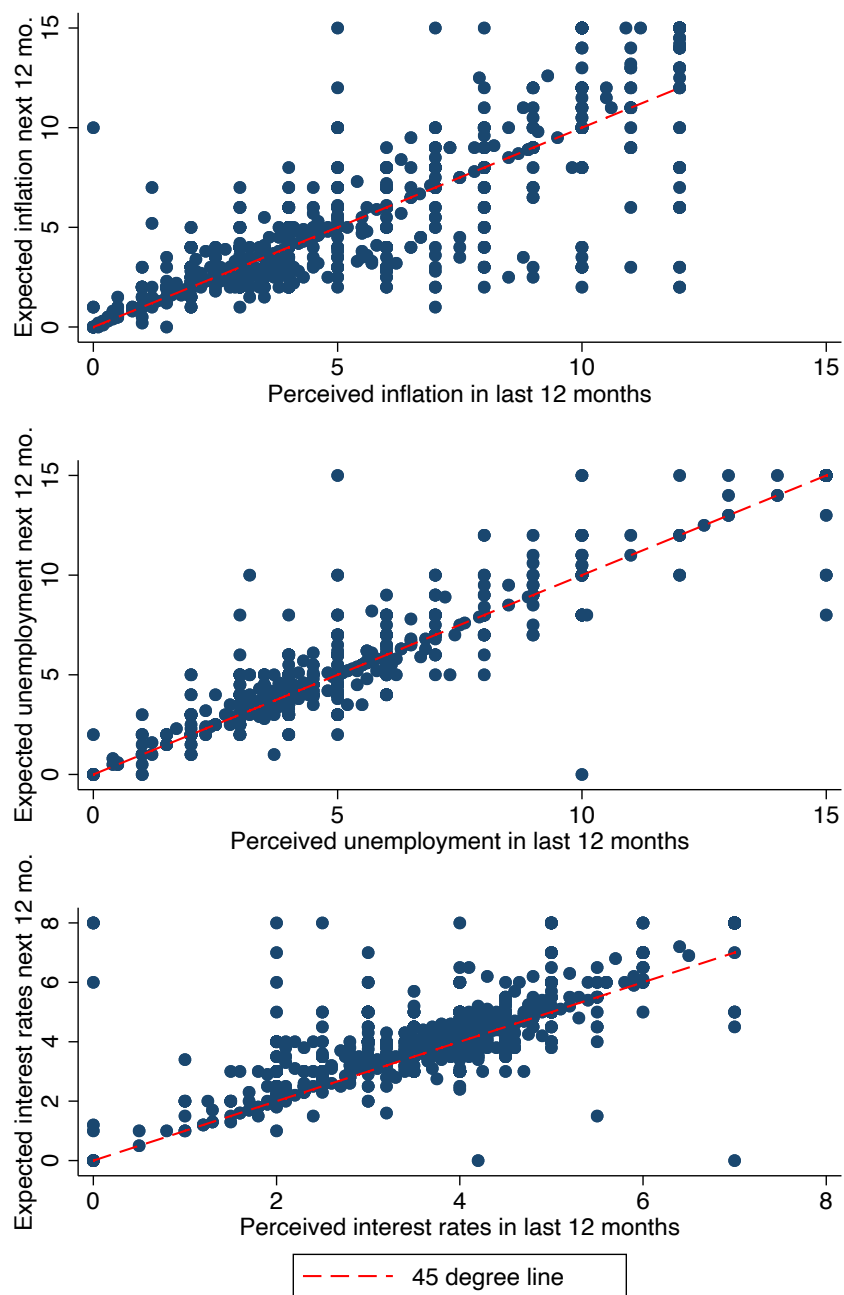
Monetary policy shock vignette

50% sample: Positive 50% sample: Negative

- Impact on personal economic choices
- Costs of firms or Household expenditure (channel, qualitative)
- Inflation (qualitative + point estimate)
- Unemployment (qualitative + point estimate)
- Stock market prices (qualitative)

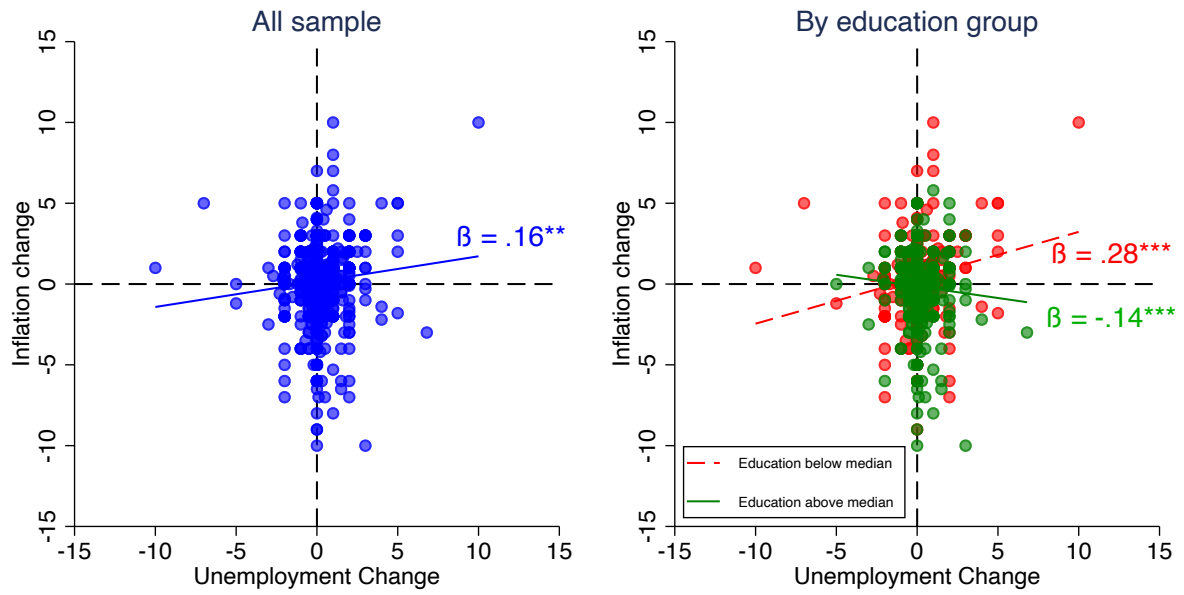
Notes. Sequence of blocks in the survey. “Placebo” refers to the discovery of a copper mine in Australia. The monetary policy shock vignette simulates an unexpected change in the European Central Bank policy rate of 50 basis points in absolute value.

Figure A1: Overview of the survey structure



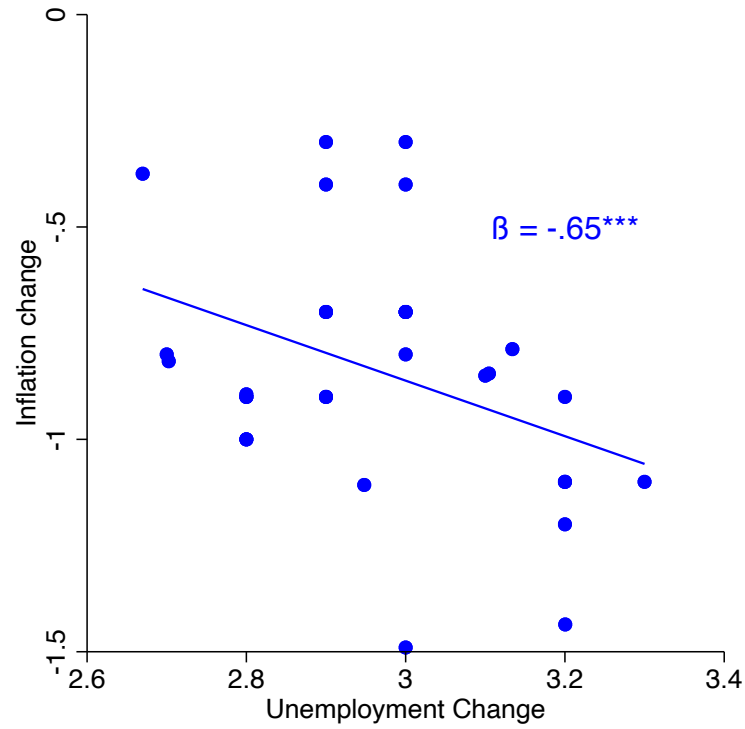
Notes. Correlation of twelve-month-ahead expectations with perceptions for inflation, unemployment, and mortgage rates. Top panel: inflation, slope 0.871 (robust SE 0.03). Middle panel: unemployment, slope 0.939 (robust SE 0.02). Bottom panel: mortgage rate on new loans, slope 0.830 (robust SE 0.02).

Figure A2: Correlation between perceptions and expectations



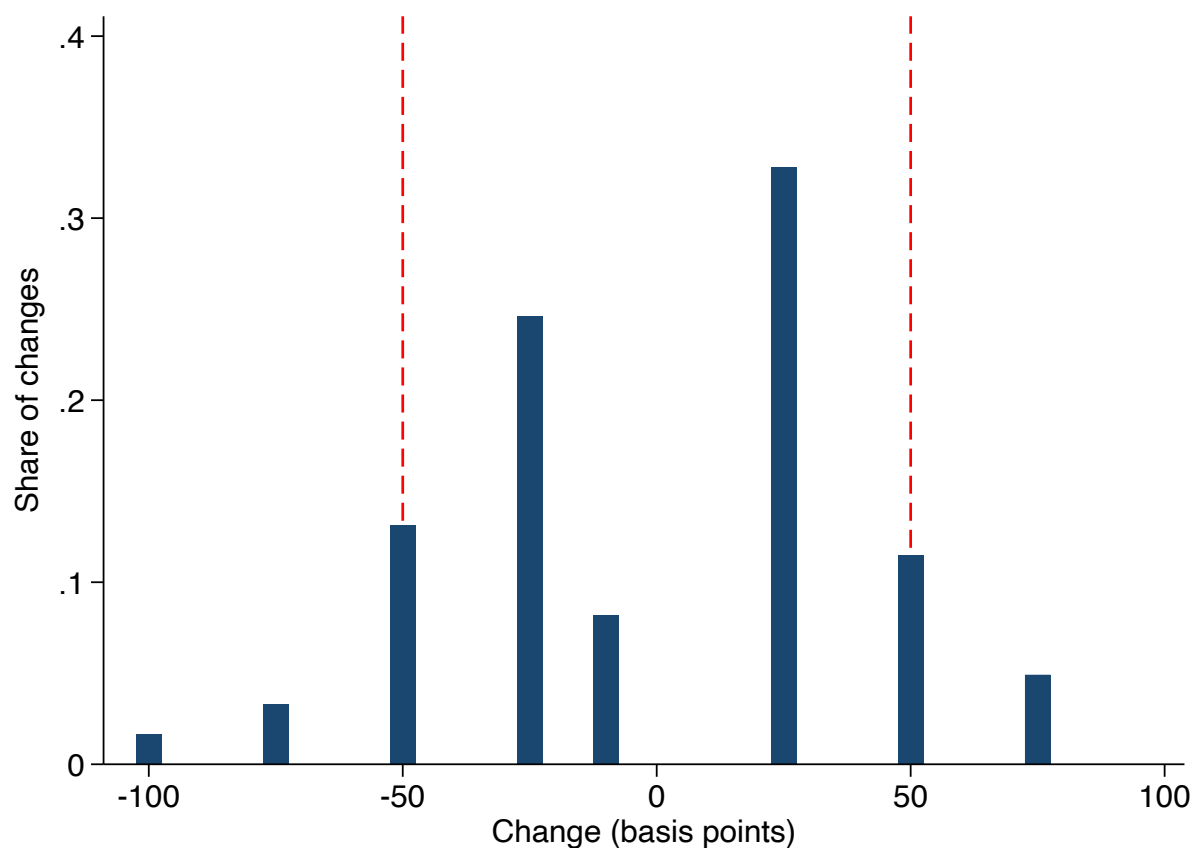
Notes. Correlation between households' expected changes in unemployment (x -axis) and expected changes in inflation (y -axis). The left panel pools all respondents; the right panel reports the correlation separately for respondents with below- and above-median years of education. Each dot is an individual observation. The fitted lines and the reported slopes β are estimated at the individual level from regressions of expected inflation changes on expected unemployment changes, controlling for age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, and a placebo control. Huber-White standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure A3: Phillips correlation and the role of education - scatter plot



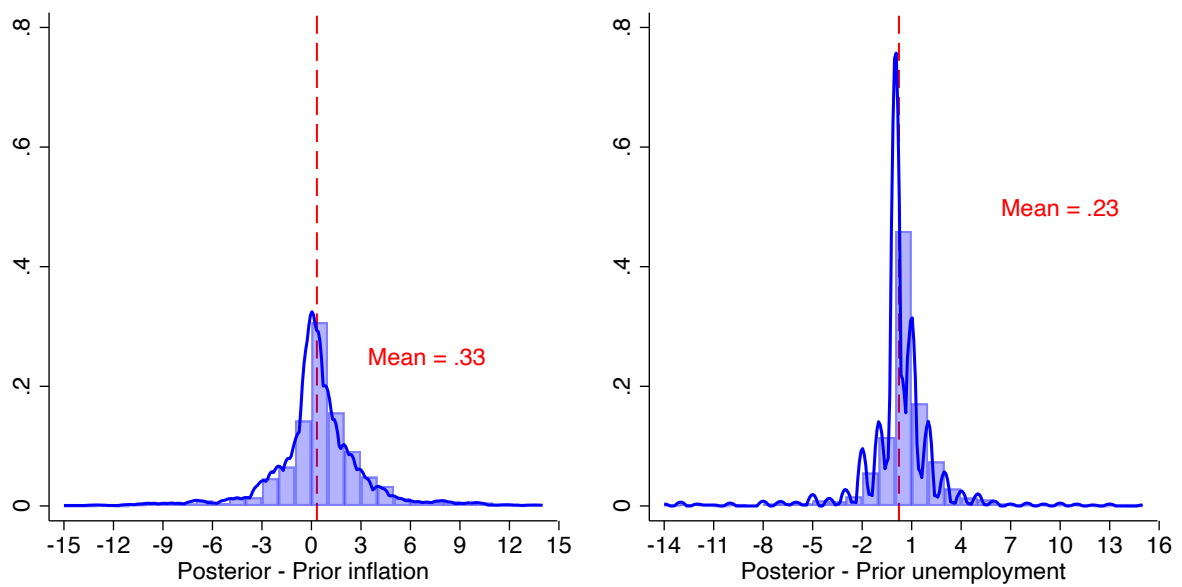
Notes. Correlation between professional forecasters' expected changes in unemployment (x-axis) and expected changes in inflation (y-axis). Data are from the ECB Survey of Professional Forecasters, 2024Q2 wave, using twelve-month-ahead expectations for inflation and unemployment. Expected changes are computed by subtracting current (2024Q2) values for the Netherlands, assuming forecasters observe current conditions. Slopes are estimated by OLS. Huber–White standard errors. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure A4: Phillips correlation - professional forecasters



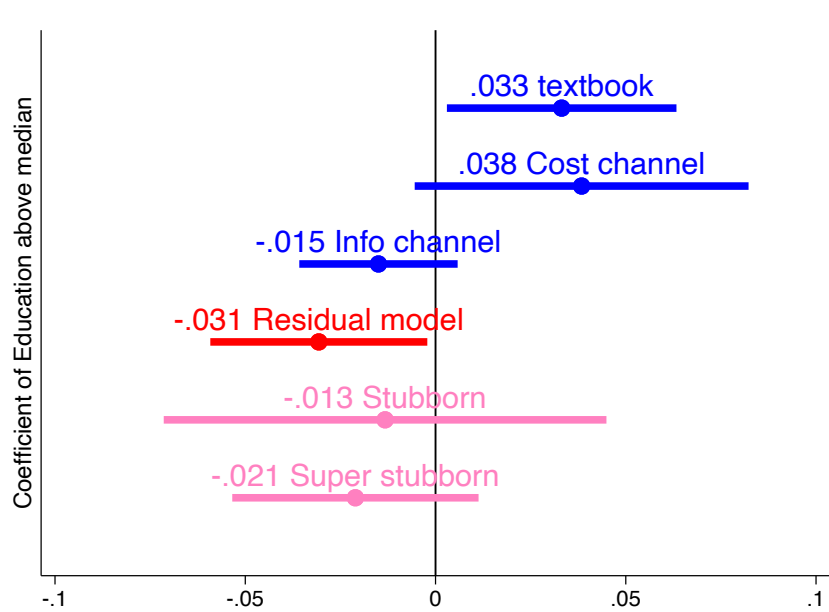
Notes. European Central Bank, ECB Deposit Facility Rate for the Euro Area [ECBDFR], retrieved from FRED, Federal Reserve Bank of St. Louis (<https://fred.stlouisfed.org/series/ECBDFR>), 13 September 2025.

Figure A5: ECB interest rate changes since 1999



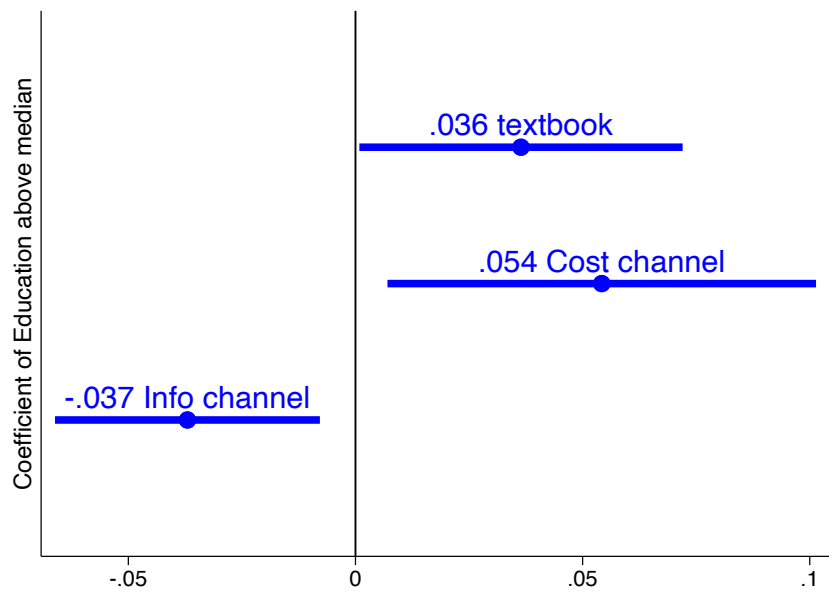
Notes. Shock size in the vignette: 50 basis points. Responses to unexpected policy easings are pooled with those to policy tightenings. Densities are estimated with an Epanechnikov kernel (bandwidths 0.2494 for inflation and 0.1660 for unemployment).

Figure A6: Distribution of subjective impulse responses (SIRs)



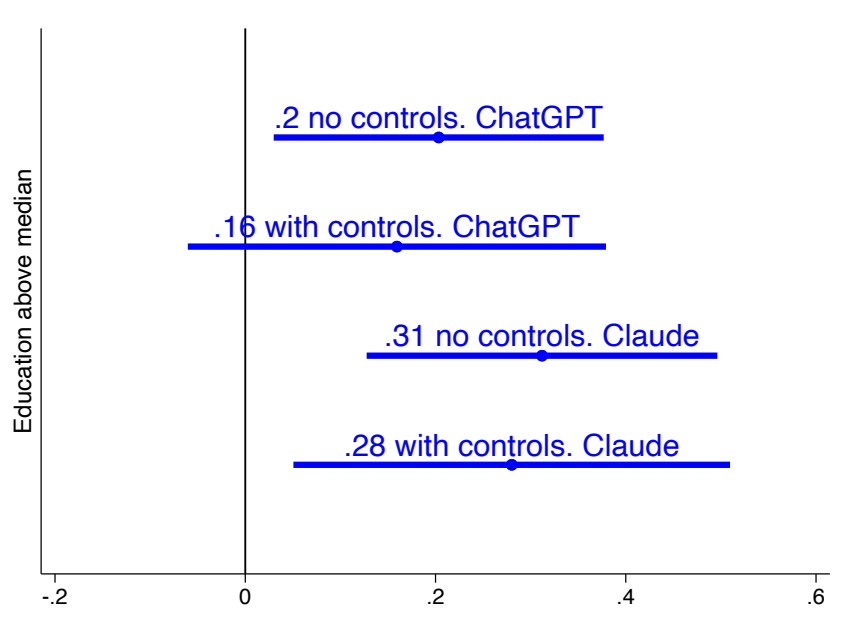
Notes. Estimated coefficients of the high-education indicator from separate OLS regressions in which the dependent variable equals one if a respondent belongs to a given mental-model group. Each specification adds controls for asset ownership (financial assets, insurance), borrowing status (mortgage), political orientation (0–10 left–right scale), self-employment, and field of study (economics vs. other). The baseline controls (age, gender, marital status, number of children, net income, employment status, homeownership, economic sentiment, and the placebo score) are included in all regressions. Huber–White standard errors.

Figure A7: Robustness to additional controls



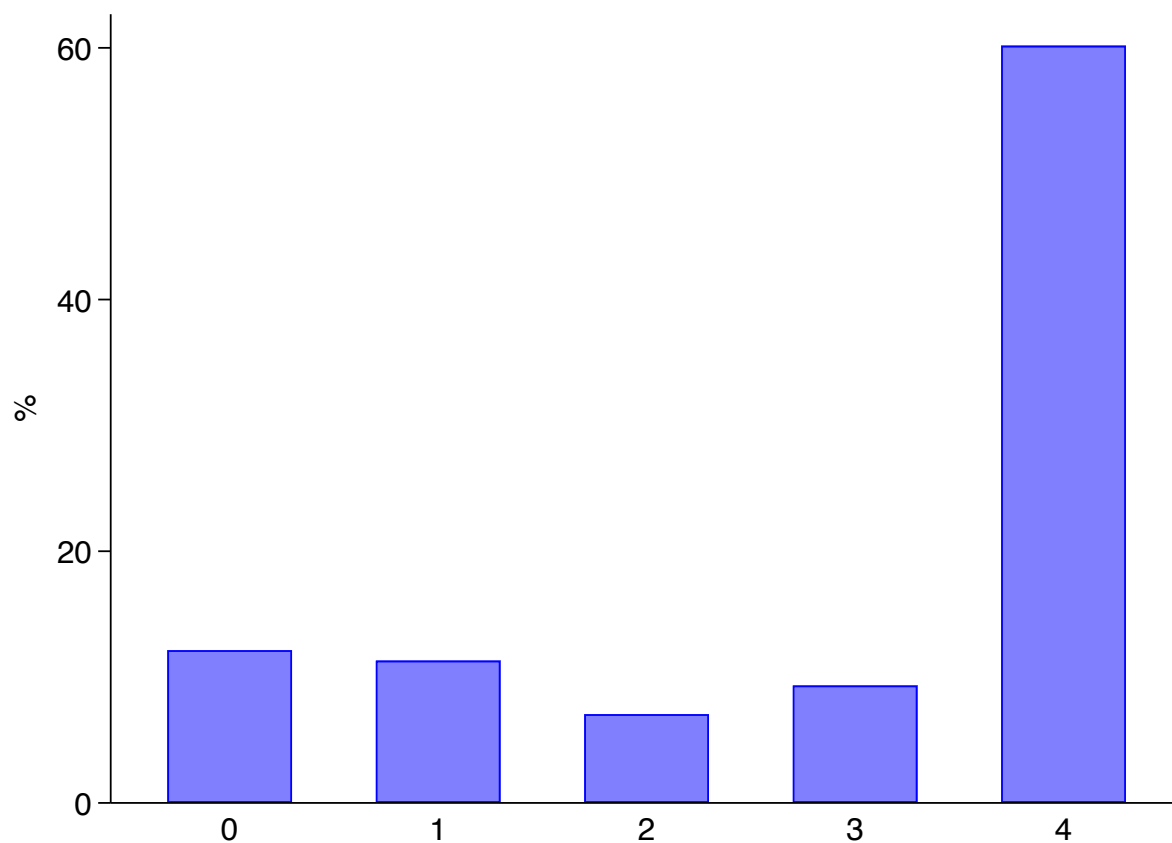
Notes. OLS coefficients of the high-education indicator from regressions in which the dependent variable is an indicator for belonging to each mental-model group, defined using only the signs of the SIRs of inflation and unemployment (without restrictions on the stock-price response). Controls: age, gender, marital status, number of children, net income, employment status, homeownership, economic sentiment, the placebo score, and the expected change in the mortgage rate. Huber–White standard errors.

Figure A8: Mental models and education without stock-market restrictions



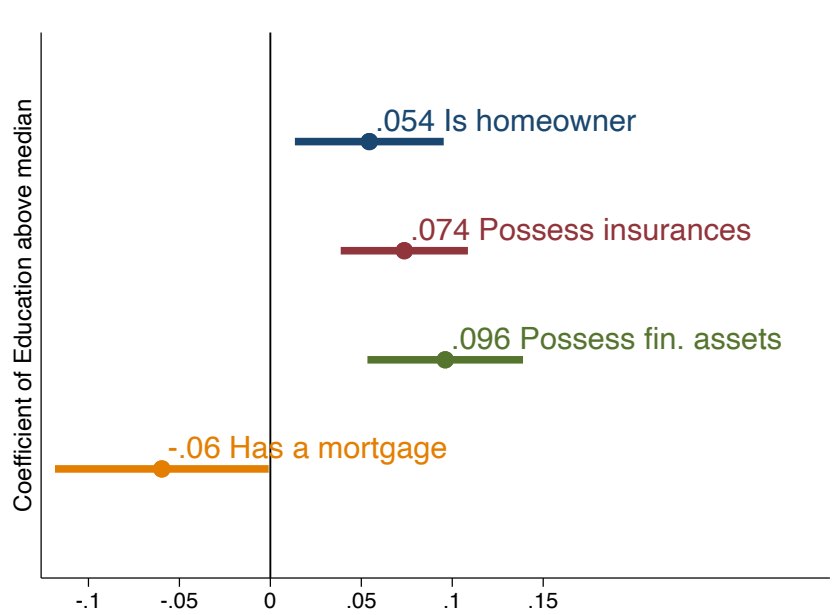
Notes. Probit coefficients of a high-education indicator, where the dependent variable indicates whether a respondent's open-ended answer on consumption and saving responses to the monetary policy shock contains substitution-effect reasoning, defined as recognizing that higher interest rates raise the return to saving and make delayed consumption more attractive. Results are reported with and without controls (age, gender, marital status, number of children, net income, employment status, homeownership, and economic sentiment) and for two LLM-based classifications of the open-ended answers, using ChatGPT and Claude (see Appendix E). Confidence bands use Huber–White standard errors.

Figure A9: Substitution narrative and education in open-ended questions



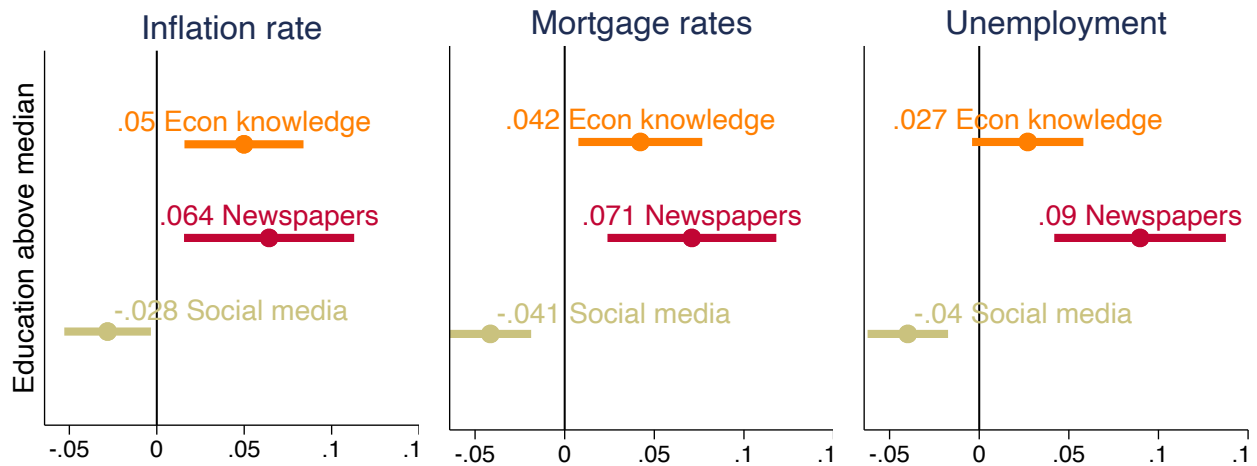
Notes. Scenario: the discovery of a copper mine in Australia. The survey asks about changes in firms' costs, households' expenditures, goods' prices, and unemployment in the Netherlands (increase/decrease/no change in response to the scenario). The placebo score ranges from 0 to 4 and awards one point per "no change" response; "down" responses for firms' costs and goods' prices also count as correct, in line with general-equilibrium reasoning.

Figure A10: Placebo score



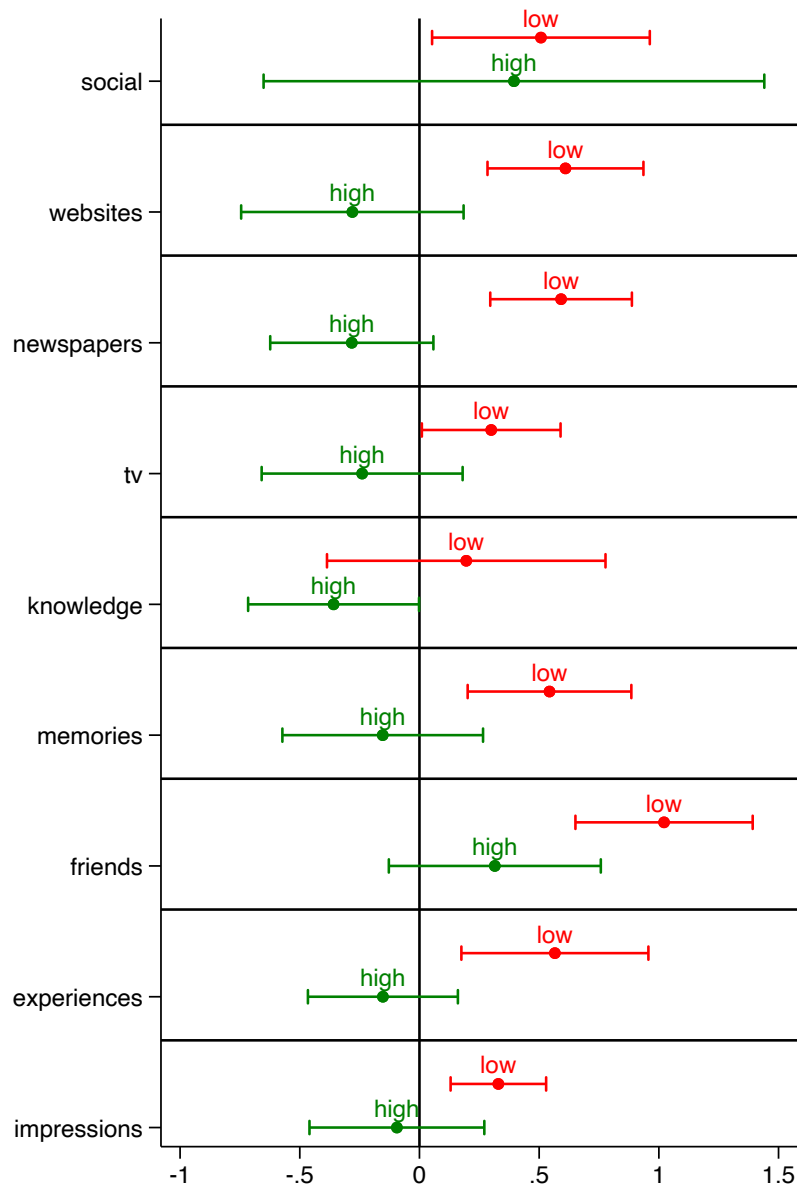
Notes. OLS regressions in which the dependent variable equals one if the respondent is in a given financial condition and zero otherwise, estimated one condition at a time. The figure reports the coefficient on “education above median” in each regression. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, the placebo score, randomization group, and the expected change in the mortgage rate (priors – perceptions). Huber–White standard errors.

Figure A11: Asset ownership and education



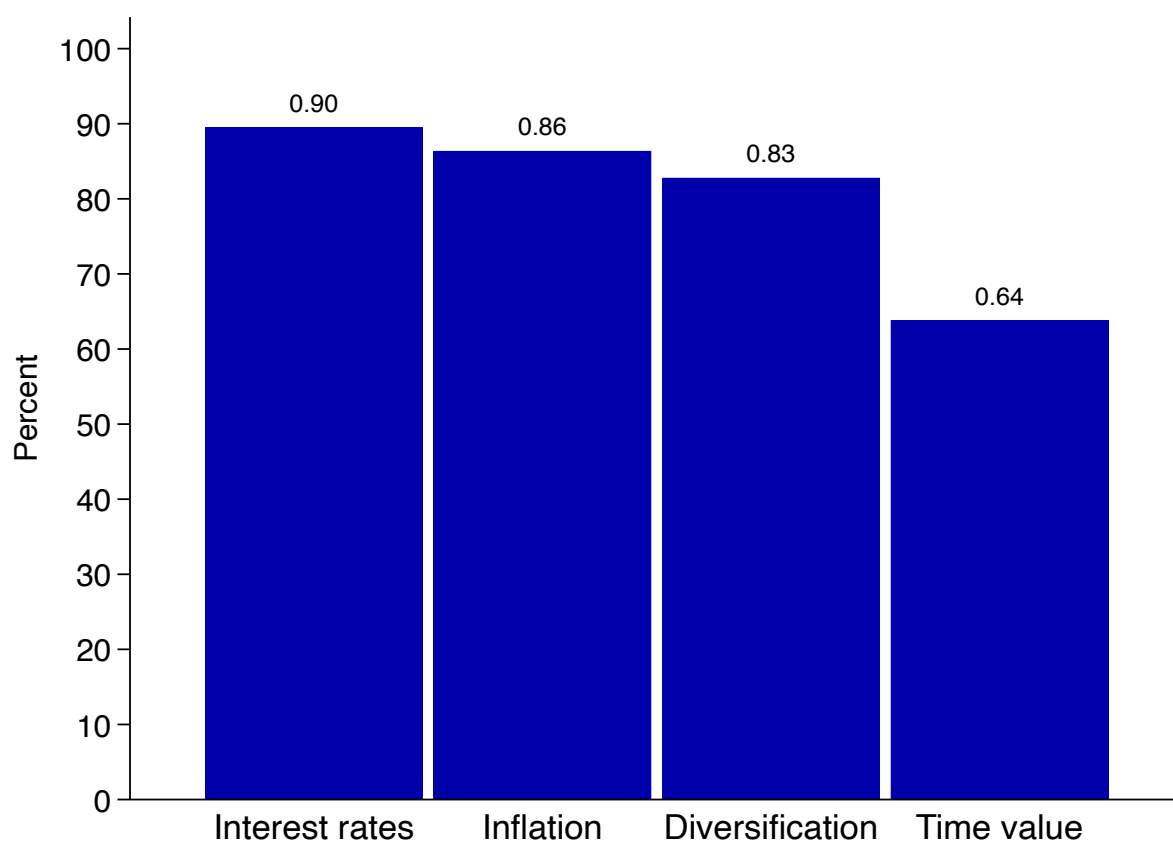
Notes. OLS regressions in which the dependent variable equals one if the respondent obtains information from a specific source and zero otherwise, estimated one source at a time. Controls: gender, age, marital status, number of children, net monthly income, employment status, homeownership, sentiment, and the placebo score.

Figure A12: Information source and education



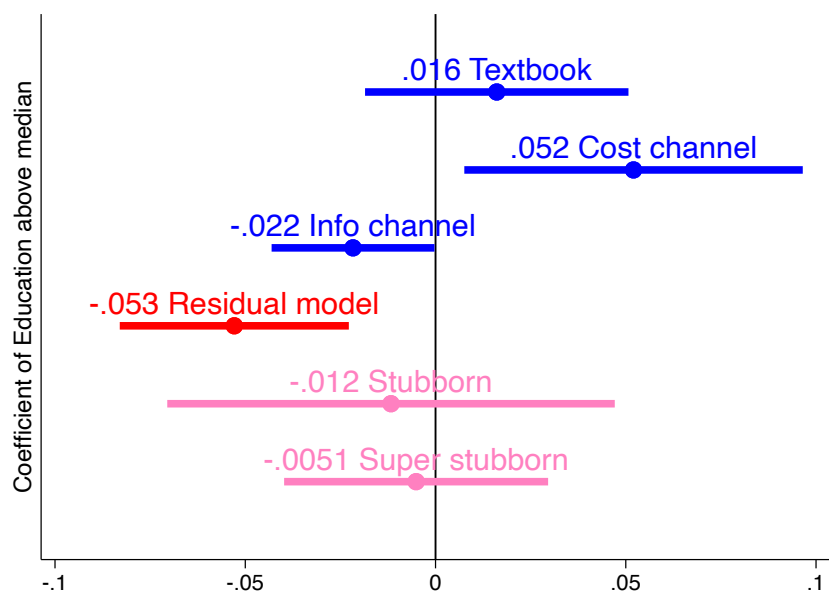
Notes. Estimated slopes from separate regressions of expected inflation changes on expected unemployment changes (the Phillips correlation), within groups defined by the self-reported information source used to form inflation and/or unemployment expectations. Each bar reports the estimated slope for high- or low-education respondents within a source group. Regressions include standard demographic controls. Huber–White standard errors.

Figure A13: Phillips correlation and education by information source



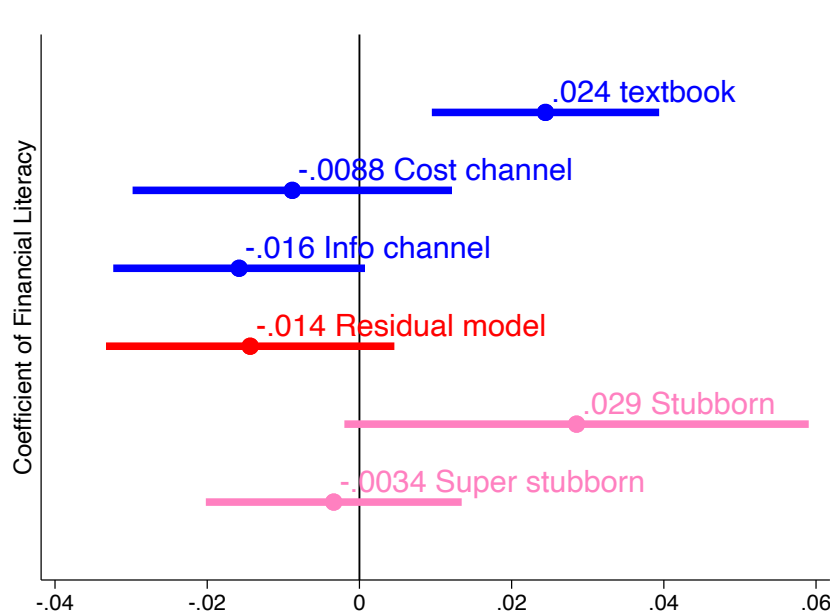
Notes. Share of correct answers to the four financial-literacy questions administered in the follow-up survey (August 2025). The questions cover compound interest, inflation, risk diversification, and the time value of money. See Appendix D for the question wording.

Figure A14: Financial literacy performance



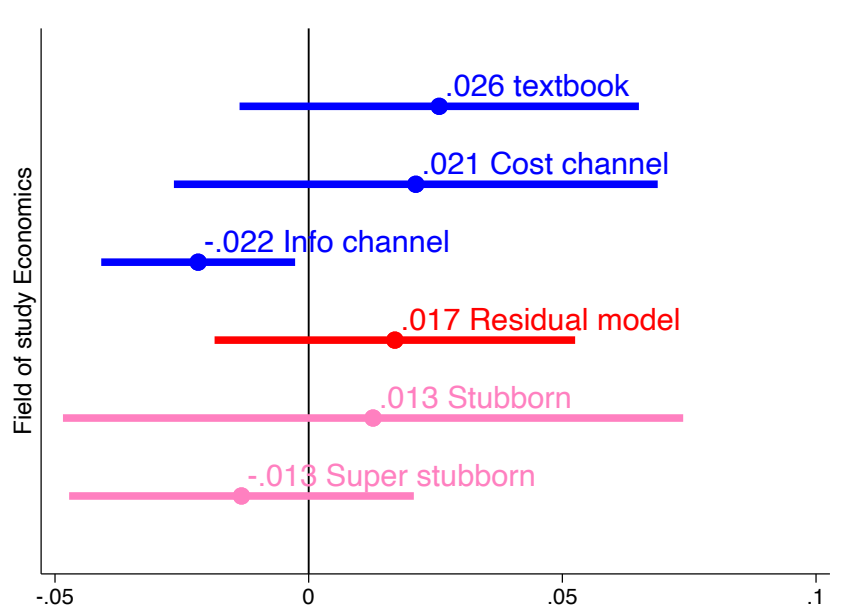
Notes. OLS coefficients of education from separate regressions in which the dependent variable is an indicator for membership in each mental model (defined in Figure 2 and Table 3). Controls: financial-literacy score, demographics, sentiment, the placebo score, randomization group, and the expected change in the mortgage rate (priors – perceptions). Huber–White standard errors.

Figure A15: Mental models and education - controlling for financial literacy



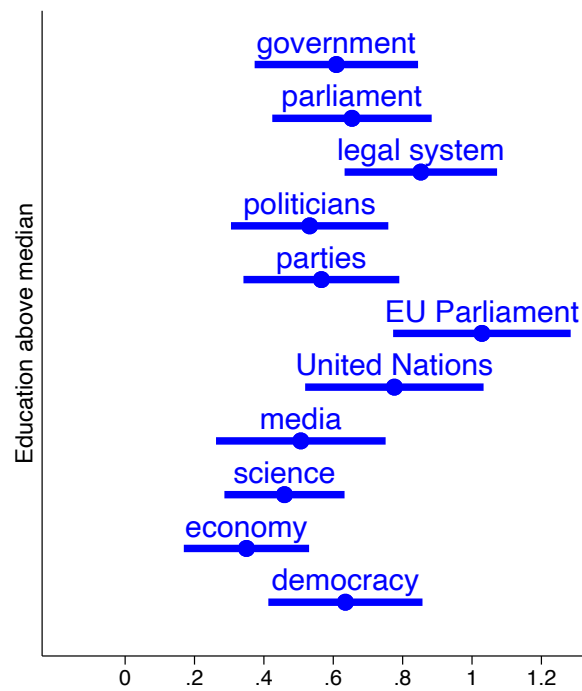
Notes. OLS coefficients of financial literacy from separate regressions in which the dependent variable is an indicator for membership in each mental model (defined in Figure 2 and Table 3). Financial literacy is an indicator equal to one if the respondent answered all four literacy questions correctly. Controls: demographics, economic sentiment, the placebo score, randomization group, and the expected change in the mortgage rate (priors – perceptions). Huber–White standard errors.

Figure A16: Mental models and financial literacy



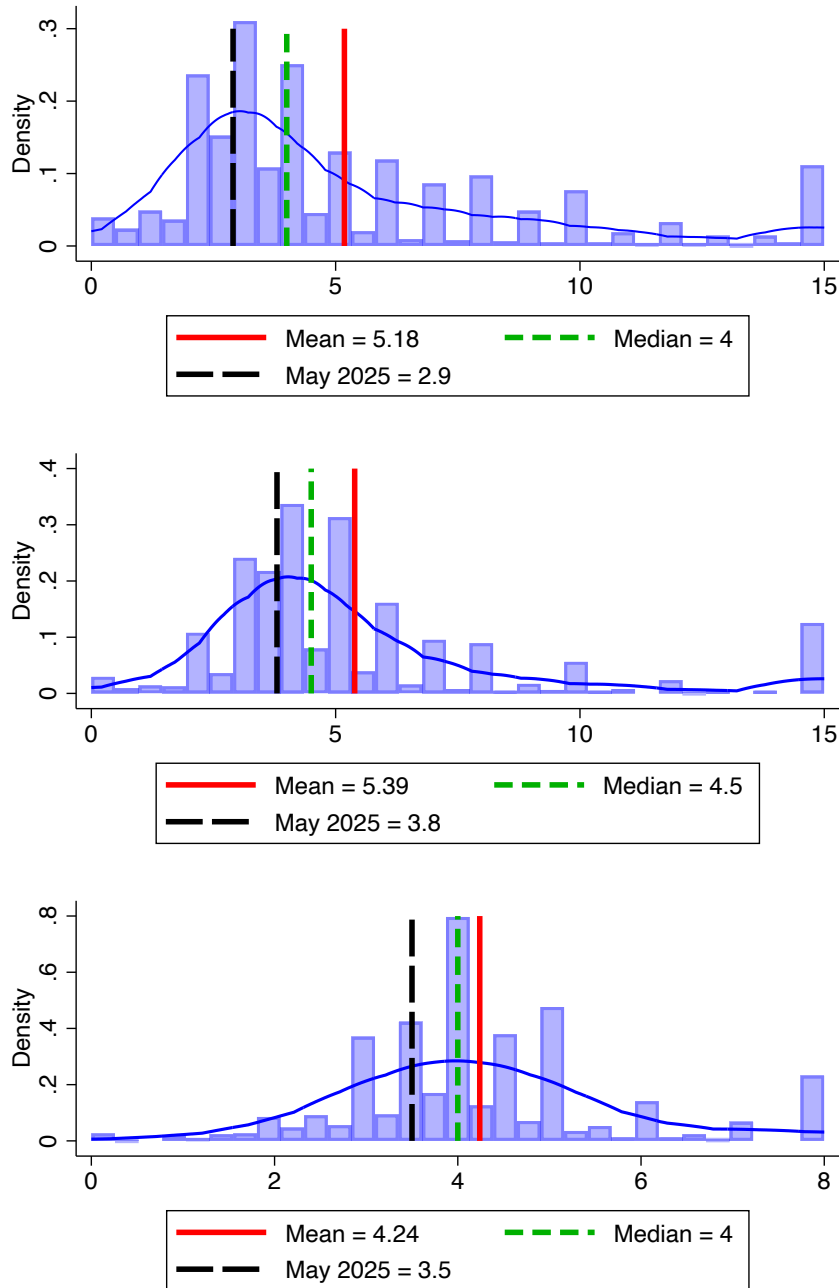
Notes. Estimated coefficients of *Field Economics* from OLS regressions in which the dependent variable equals one if a respondent belongs to a given mental-model group, as defined in Figure 2 and classified using the stock-price sign restrictions in Table 3. *Field Economics* equals one if the respondent's highest degree (irrespective of level) is in economics, management, business administration, or accounting. Controls: gender, age, marital status, number of children, net monthly income, employment status, homeownership, sentiment, the placebo score, randomization group, and the expected change in the mortgage rate (priors – perceptions). Huber–White standard errors.

Figure A17: Mental models and economics education



Notes. Estimated coefficients of the education indicator (high vs. low education) from separate OLS regressions in which the dependent variable is the respondent's reported confidence (0–10 scale) in a given institution. Institutions: the Dutch government, parliament, legal system, political parties, the European Union, the United Nations, the media, science, the economy, and democracy. Controls: gender, age, marital status, number of children, net household income, employment status, homeownership, economic sentiment, and the placebo score. Huber–White standard errors.

Figure A18: Trust in institutions and education



Notes. Top panel: inflation rate. Middle panel: unemployment rate. Bottom panel: mortgage rate on new loans. Means and medians are location measures conditional on households' forecasts. May 2025: value of the variable in may 2025 (forecast horizon of the survey expectations). The red solid, green dotted, and black dashed lines indicate the mean, median, and May 2025 value, respectively. Densities are estimated with an Epanechnikov kernel (bandwidth 0.8).

Figure A19: Prior densities of expectations

Appendix B Additional analyses

B1. Belief distributions

The first part of the survey collects perceptions and prior expectations on inflation, unemployment, and the mortgage rate on new loans. Figure A19 documents the distribution of priors across our respondents. The expectations of respondents in our sample display: (i) a mean that clearly exceeds that of experts, proxied by the Dutch National Bank (DNB)⁴¹ (ii) a wide dispersion across households; (iii) right-skewness. These are well-documented stylized facts in the literature on inflation expectations (D’Acunto et al., 2024, Granziera et al., 2025). The densities of both the unemployment rate and mortgage rate expectations show a smaller deviation from the DNB’s forecast, as well as lower dispersion and less pronounced positive skewness compared to inflation expectations. To some extent, this is not a surprise: labor market conditions are possibly easier to understand and more frequently monitored than inflation, which is a complex phenomenon (Binetti et al., 2024). Moreover, in our sample, 80% of households have a mortgage, which has been shown to raise households’ attention to interest rate developments, particularly when inflation is high (Baldassarri et al., 2024).

Wrapping up, our data: (i) replicate the well-established facts regarding households’ inflation beliefs; (ii) document a lower skewness and deviation from professional forecasts concerning unemployment beliefs; (iii) point to an even less dispersed distribution across households as far as mortgage rates are concerned.

B2. Belief inertia and shock anticipation

One possibility to explain this prevalence of stubborn individuals is that our respondents had already factored in expected changes in the *actual* policy rate when responding to our vignette. In May 2024, expectations were set for a cut of the policy rate at the following monetary policy decision meeting.⁴² A 25 basis points cut materialized in June 2024. If the survey respondents were anticipating the rate cut, we should observe a much stronger reaction among those presented with the scenario describing a policy rate increase, compared to those shown a rate cut. Regressions reported in Table A4 that test for the possibly larger effect of interest rate increases proposed by our vignette failed to support this explanation. As an additional test of this hypothesis, we construct a respondent-level measure of the unexpectedness of the vignette shock. Specifically, we define the variable *Surprise* as the absolute difference between the vignette shock (± 0.5 percentage points) and the respondents’ own expected change in the mortgage rate, $\Delta \mathbb{E}_{r,t+1}^i$, computed as the difference between

⁴¹Notably, the median inflation expectation in our sample exceeds the DNB forecast by 1.2 percentage points (see Table A5). This value falls within the range documented by earlier studies, which find that household inflation expectations typically exceed professional forecasts by 1–3 percentage points (Carroll, 2003, Armantier et al., 2016, Coibion et al., 2018). Our figure lies at the lower end of this spectrum, likely reflecting heightened household attention to inflation in the post-pandemic period (Weber et al., 2025, Link et al., 2024).

⁴²See e.g., <https://www.reuters.com/markets/rates-bonds/ecb-rate-cut-case-getting-stronger-says-chief-economist-lane-2024-05-06/>.

the unconditional expectation and perception of the current mortgage rate—both elicited at the beginning of the survey:⁴³

$$Surprise \equiv |\pm 0.5 - \Delta \mathbb{E}_r^i|$$

Under this definition, $Surprise = 0$ implies that the respondent expected a rate change of exactly the same size and sign as the one described in the vignette. If belief inertia reflects prior expectations about monetary policy actions, we would expect respondents with $Surprise \approx 0$ —that is, those who anticipated the interest rate change—to be more likely to exhibit stubborn behavior, meaning they expect no effect of the policy shock on inflation or unemployment. To test this, we define *Low Surprise* using different bandwidths: either exactly zero, or values close to zero (e.g., within 10 or 25 basis points). Regression results reported in Table A6 show no significant relationship between the degree of surprise and the likelihood of being classified as stubborn. This suggests that prior anticipation of the shock does not explain the observed belief inertia, helping us rule out the hypothesis that expectations inertia is mechanically induced by foreseen policy moves.

B3. Random guessing benchmark

In the survey, participants provide point estimates for inflation and unemployment in response to the monetary policy shock described in the vignette. By computing the difference between these expectations—referred to as posteriors—and the unconditional forecasts collected at the beginning of the survey, we derive subjective impulse responses (SIRs) for each individual. We then use the sign of each SIR (positive, negative, or zero) to classify respondents into distinct mental model groups.

Conceptually, this task can be thought of as a “guessing game” in which respondents must indicate whether the response of each variable is positive, negative, or zero. If individuals were answering entirely at random, each sign would be chosen with equal probability (1/3), and each of the nine possible sign combinations across the two variables would occur with equal likelihood (1/9). The table below illustrates this uniform distribution under random guessing:

	$SIR_\pi < 0$	$SIR_\pi = 0$	$SIR_\pi > 0$
$SIR_u < 0$	1/9	1/9	1/9
$SIR_u = 0$	1/9	1/9	1/9
$SIR_u > 0$	1/9	1/9	1/9

⁴³Our underlying assumption is that respondents expect the mortgage rate to move one-to-one with the policy rate. While we cannot test this hypothesis, because our survey does not include post-vignette expectations for mortgage rates, we note that the correlation between the short-term Euro area interest rate and the Dutch mortgage rate over the 2003–2024 period is 0.77. Moreover, monetary policy shocks account for a substantial share of the variation in short-term rates (Altavilla et al., 2019).

Based on this distribution, Figure A20 shows the implied probability of being assigned to each of the six mental model groups (textbook, cost channel, information channel, residual, stubborn, and super stubborn) under pure random guessing.

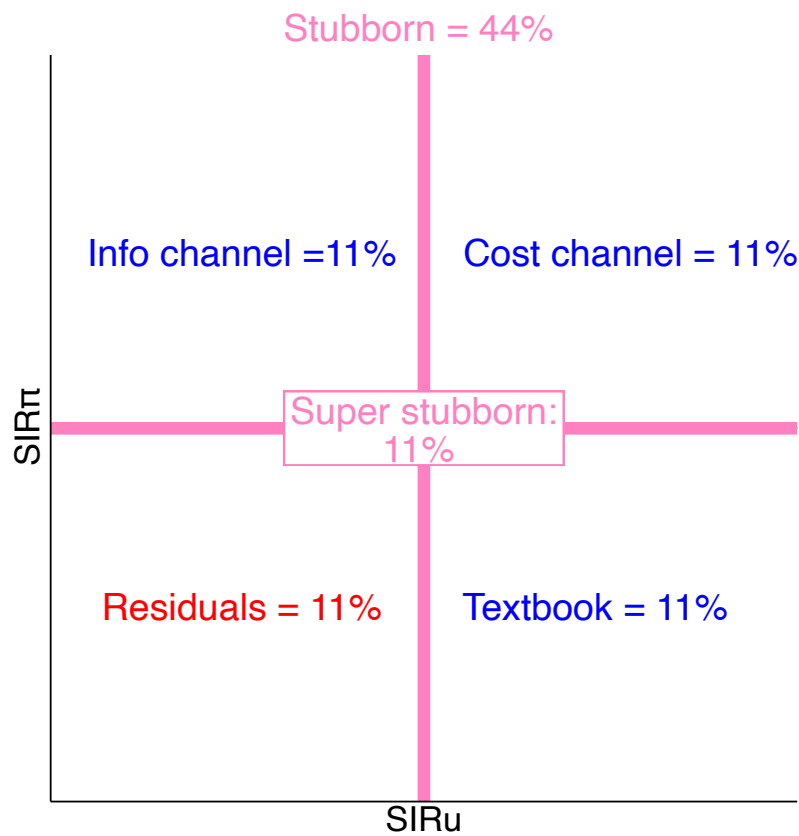
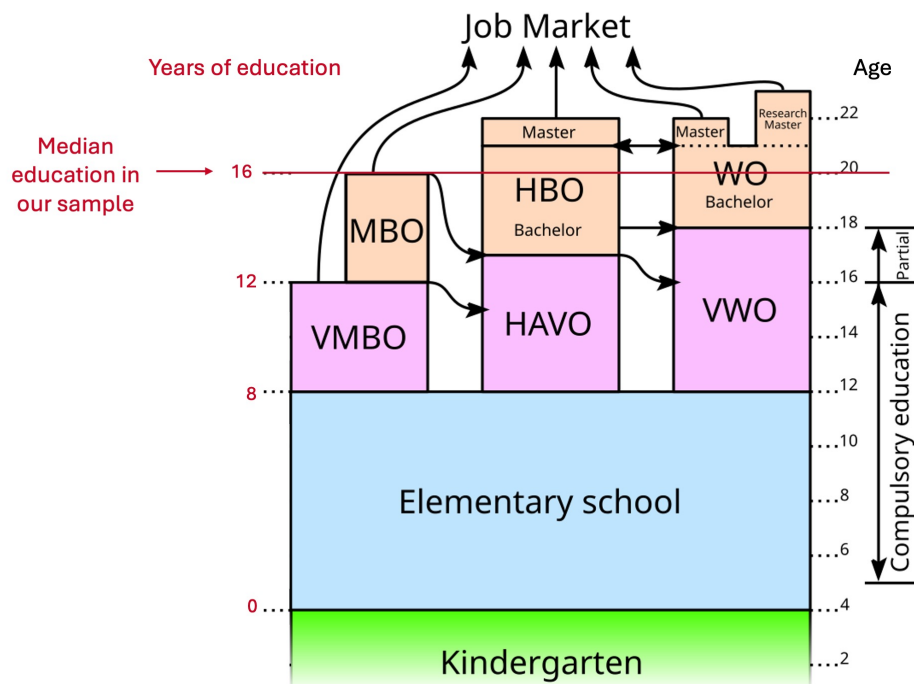


Figure A20: Probability of group assignment by random guessing

Appendix C The Dutch education system



Notes. Image credit: Tijmen Stam, *Dutch Education System-en.svg*, Wikimedia Commons. Licensed under the Creative Commons Attribution-ShareAlike 2.5 Generic, 2.0 Generic, and 1.0 Generic license. Available at https://commons.wikimedia.org/wiki/File:Dutch_Education_System-en.svg. The left-hand scale indicating years of education (in red) is added by the authors.

Figure A21: Dutch education system

C1. Overview of the Dutch education system

The Dutch education system is characterised by early tracking and a wide range of educational pathways. Children typically enter primary school at age four, and education becomes compulsory from age five. Primary education lasts eight years (ages four to twelve). On completing it, students are tracked—on the basis of academic performance and a school recommendation—into one of three forms of secondary education.

Pre-vocational secondary education (VMBO) is vocationally oriented and lasts four years; it prepares students for senior secondary vocational education (MBO), which is offered at several qualification levels and leads either to direct entry into the labour market or, at its higher levels, to higher professional education. Senior general secondary education (HAVO) is a distinct five-year track positioned between the vocational and pre-university routes; it prepares students for higher professional education (HBO), offered by universities of applied sciences (*hogescholen*), which combines theoretical instruction with substantial practical training, including internships and project-based learning. Completion of higher professional education grants access to the labour market and, under certain conditions, to master's programmes. Pre-university secondary education (VWO) is a six-year academic

track designed to prepare students for research-oriented study at universities (WO), ultimately leading to bachelor's, master's, and doctoral degrees.

Together, these pathways are organised within a unified qualifications framework that allows permeability across tracks, enabling students to move between routes and pursue the form of higher education that best matches their skills and academic orientation.

C2. Exposure to economics teaching

During compulsory education in the Netherlands, exposure to economics is limited and highly uneven. In primary education, economics, finance, accounting, and business are not taught as formal subjects, and students complete this stage without systematic instruction in economic reasoning or macroeconomic concepts. In secondary education, exposure depends on both track and subject choice. In pre-vocational secondary education (VMBO), economics-related content, when present, is typically practical and context-specific (e.g. commerce or administrative skills) and varies substantially across learning pathways. In the academically oriented tracks (HAVO and VWO), students choose one of four subject profiles in the upper years of secondary school: *Culture and Society*, *Economics and Society*, *Nature and Health*, or *Nature and Technology*. Formal instruction in economics is concentrated in the optional *Economics and Society* profile, where economics is taught as a distinct subject covering markets, government intervention, and basic macroeconomic topics. Students selecting other profiles may complete secondary education without any formal coursework in economics. As a result, exposure to economics during compulsory schooling is neither universal nor mandatory, and varies substantially across individuals depending on secondary-school track and profile choice.

C3. Resources

Additional information on the structure of the Dutch education system and the curricular content associated with each educational track is available from Nuffic, the Dutch organisation for internationalisation in education, which works on behalf of the Ministry of Education, Culture and Science, the Ministry of Foreign Affairs, and the European Commission. Relevant resources include:

- Overview of the Dutch education system
- Primary and secondary education
- Secondary vocational education (MBO)
- Higher education (HBO and WO)

Appendix D Text of the survey

Main study: survey May 2024

Notes

- The vignettes are randomized: half of the sample sees the negative scenarios (version A), and the other half sees the positive scenarios (version B).
- All questions are compulsory.

Introduction to the Questionnaire

This questionnaire is about your views on key aspects of the economy. Some questions might be difficult to answer. There are no right or wrong answers. We are interested in your opinions and experiences.

1) Sentiment

1) To what extent do you agree or disagree with the following statements?

(1 = Strongly disagree; 5 = Strongly agree)

- Compared to my peers (like family, friends, or neighbors), I generally think I am financially better off.

Options: 1 2 3 4 5

- My financial situation will be better 12 months from now than it is today.

Options: 1 2 3 4 5

2) Interest Rate Expectations

Imagine you need to borrow money to buy a house or apartment (mortgage). The following questions concern the annual interest rate at which you could get the loan.

Interest refers to the money paid to the lender for a loan. Mortgage rates depend on market developments. Over the past 20 years, mortgage rates in the Netherlands have ranged from 1.3% to 5.5%.

1) Do you think the mortgage interest rate today (May 2024) is higher or lower compared to 12 months ago (May 2023)?

☐ Definitely higher

☐ Probably higher

☐ Stayed the same

☐ Probably lower

☐ Definitely lower

2) Imagine you needed to borrow money to buy a house or apartment. At what interest rate do you think you could have borrowed money over the past 12 months (May 2023 to May 2024)? Please give your best estimate.

Answer: _____%

3) Do you think the mortgage interest rate will be higher or lower 12 months from now (May 2025) compared to today (May 2024)?

☐ Definitely higher

☐ Probably higher

☐ Will stay the same

☐ Probably lower

☐ Definitely lower

4) Imagine you need to borrow money to buy a house or apartment. At what annual interest rate do you think you could borrow money over the next 12 months (May 2024 to May 2025)? Please give your best estimate.

Answer: _____%

3) Inflation Expectations

The following questions concern inflation.

Inflation is the general rise in prices for goods and services. For example, if inflation is 2%, goods and services that cost €100 today will cost €102 a year from now. In the Netherlands, inflation over the past 20 years has ranged from 0.2% to 14.5%.

1) Do you think inflation today (May 2024) is higher or lower compared to 12 months ago (May 2023)?

☐ Definitely higher

☐ Probably higher

☐ Stayed the same

☐ Probably lower

☐ Definitely lower

2) What do you think the inflation rate in the Netherlands was over the past 12 months (May 2023 to May 2024)? Please give your best estimate.

Answer: _____%

3) Do you think inflation will be higher or lower 12 months from now (May 2025) compared to today (May 2024)?

☐ Definitely higher

☐ Probably higher

☐ Will stay the same

☐ Probably lower

☐ Definitely lower

4) What do you think the inflation rate in the Netherlands will be over the next 12 months (May 2024 to May 2025)? Please give your best estimate.

Answer: _____%

4) Unemployment Expectations

The following questions concern unemployment.

Someone is unemployed if they are not working but are actively seeking employment.

The unemployment rate refers to the percentage of unemployed individuals in the labor force, which includes both employed and unemployed people. Over the past 20 years, the unemployment rate in the Netherlands has ranged from 3.2% to 9%.

1) Do you think the unemployment rate today (May 2024) is higher or lower compared to 12 months ago (May 2023)?

☐ Definitely higher

☐ Probably higher

☐ Stayed the same

☐ Probably lower

☐ Definitely lower

2) What do you think the unemployment rate in the Netherlands was over the past 12 months (May 2023 to May 2024)? Please give your best estimate.

Answer: _____%

3) Do you think the unemployment rate will be higher or lower 12 months from now (May 2025) compared to today (May 2024)?

☐ Definitely higher

☐ Probably higher

☐ Will stay the same

☐ Probably lower

☐ Definitely lower

4) What do you think the unemployment rate in the Netherlands will be over the next 12 months (May 2024 to May 2025)? Please give your best estimate.

Answer: _____%

5) Information Sources

The order of answer options should be randomized.

1) On what is your estimate of interest rates based? (Multiple answers possible)

☐ Personal impressions

☐ Personal experiences

- ☐ Experiences of friends and family
- ☐ Memories from the past
- ☐ Economic knowledge
- ☐ News on TV
- ☐ News in newspapers (print and/or online)
- ☐ News on news websites
- ☐ News on social media

2) On what is your estimate of inflation based? (Multiple answers possible)

- ☐ Personal impressions
- ☐ Personal experiences
- ☐ Experiences of friends and family
- ☐ Memories from the past
- ☐ Economic knowledge
- ☐ News on TV
- ☐ News in newspapers (print and/or online)
- ☐ News on news websites
- ☐ News on social media

3) On what is your estimate of unemployment based? (Multiple answers possible)

- ☐ Personal impressions
- ☐ Personal experiences
- ☐ Experiences of friends and family
- ☐ Memories from the past
- ☐ Economic knowledge
- ☐ News on TV
- ☐ News in newspapers (print and/or online)

☐ News on news websites

☐ News on social media

6) Introduction to the Vignettes

The following questions are about situations or events in the economy. Answer the questions based on the information provided and your personal judgment. There are no right or wrong answers: give your best estimate.

7) Placebo

Imagine that a new copper mine is discovered in Australia.

Note: The Netherlands does not import copper from Australia.

What would happen to the following?

1) The costs for Dutch companies:

☐ Increase

☐ Decrease

☐ No change

2) The expenditures of Dutch households:

☐ Increase

☐ Decrease

☐ No change

3) The prices of goods in the Netherlands:

☐ Increase

☐ Decrease

☐ No change

4) Unemployment in the Netherlands:

☐ Increase

☐ Decrease

☐ No change

8A) Negative Monetary Policy Shock

Imagine that the European Central Bank unexpectedly raises the interest rate from 4.5% to 5%. At the same time, no other significant economic events occur.

1) How would you adjust your financial behavior if the interest rate increased?

Options: ☐ Increase / ☐ Decrease / ☐ Do nothing

- Consumer expenditures (excluding mortgage and rent)
- Mortgage payments
- Savings
- Work hours
- Purchase of durable goods
- Investment in stocks
- Borrowing
- Salary

2) How do you think the prices of goods and services will change when the interest rate increases?

☐ Definitely increase

☐ Probably increase

☐ Will not be affected by the interest rate increase

☐ Probably decrease

☐ Definitely decrease

3) What do you think the inflation rate would be 12 months from now if this event occurred today?

Answer: _____%

4) What do you think companies will do in this situation: hire more people or lay off more people?

- ☐ Definitely hire more people
- ☐ Probably hire more people
- ☐ Will not be affected by the interest rate increase
- ☐ Probably lay off more people
- ☐ Definitely lay off more people

5) What do you think the unemployment rate would be 12 months from now if this event occurred today?

Answer: _____%

6) How do you think stock prices in the stock market will respond to the interest rate increase?

- ☐ Definitely increase
- ☐ Probably increase
- ☐ Will not be affected by the interest rate increase
- ☐ Probably decrease
- ☐ Definitely decrease

8B) Positive Monetary Policy Shock

Imagine that the European Central Bank unexpectedly lowers the interest rate from 4.5% to 4%. At the same time, no other significant economic events occur.

1) How would you adjust your financial behavior if the interest rate decreased?

Options: ☐ Increase / ☐ Decrease / ☐ Do nothing

- Consumer expenditures (excluding mortgage and rent)
- Mortgage payments
- Savings

- Work hours
- Purchase of durable goods
- Investment in stocks
- Borrowing
- Salary

2) How do you think the prices of goods and services will change when the interest rate decreases?

- ☐ Definitely increase
- ☐ Probably increase
- ☐ Will not be affected by the interest rate decrease
- ☐ Probably decrease
- ☐ Definitely decrease

3) What do you think the inflation rate would be 12 months from now if this event occurred today?

Answer: _____%

4) What do you think companies will do in this situation: hire more people or lay off more people?

- ☐ Definitely hire more people
- ☐ Probably hire more people
- ☐ Will not be affected by the interest rate decrease
- ☐ Probably lay off more people
- ☐ Definitely lay off more people

5) What do you think the unemployment rate would be 12 months from now if this event occurred today?

Answer: _____%

6) How do you think stock prices in the stock market will respond to the interest rate decrease?

- ☐ Definitely increase
- ☐ Probably increase
- ☐ Will not be affected by the interest rate decrease
- ☐ Probably decrease
- ☐ Definitely decrease

Second study: survey August 2025

1) Financial literacy

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

- ☐ More than \$102
- ☐ Exactly \$102
- ☐ Less than \$102

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

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

3) 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

4) Assume a friend inherits €10,000 today and his sibling inherits €10,000 three years from now. Who is richer because of the inheritance?

- My friend
- His sibling
- They are equally rich

2) Inflation expectations

Inflation is the general rise in prices for goods and services. For example, if inflation is 2%, goods and services that cost €100 today will cost €102 a year from now. In the Netherlands, over the past 20 years, the lowest inflation was 0.2% and the highest was 14.5%.

1. What do you think the inflation rate was in the Netherlands during the past 12 months (August 2024 to August 2025)? Please give your best estimate. **Answer:**

_____ %

2. What do you think the inflation rate in the Netherlands will be over the next 12 months (August 2025 to August 2026)? Please give your best estimate.

Answer: _____ %

3) Unemployment Expectations

Someone is unemployed if they are not working but are actively seeking employment. The unemployment rate refers to the percentage of unemployed individuals in the labor force, which includes both employed and unemployed people. In the past 20 years, the unemployment rate in the Netherlands has fluctuated between 3.2% and 9%.

1. What do you think was the unemployment rate in the Netherlands in the past 12 months (August 2024 to August 2025)? Please give your best estimate. **Answer:**

_____ %

2. What do you think the unemployment rate in the Netherlands will be over the next 12 months (August 2025 to August 2026)? Please give your best estimate.

Answer: _____ %

4) Vignette

Imagine that the European Central Bank unexpectedly increases the interest rate from 2% to 2.5%. At the same time, no other significant economic events occur.

- 1) Before, you said that you expect inflation to be [insert prior] in 12 months.

What do you think the inflation rate would be 12 months from now if this event occurred today?

☐ higher than [prior]

☐ the same as [prior]

☐ lower than [prior]

- 2) Before, you said that you expect unemployment to be [insert prior] in 12 months.

What do you think the unemployment rate would be 12 months from now if this event occurred today?

☐ higher than [prior]

☐ the same as [prior]

☐ lower than [prior]

- 3) You said that you expect inflation to [increase/decrease/not change] and unemployment to [increase/decrease/not change] because of this event. Could you please explain the reasoning behind your answers, addressing both the change in inflation and in unemployment? Your answer is very important to us. Please include all details you consider relevant. *I expect inflation to [increase/decrease/not change] and unemployment to [increase/decrease/not change] because...* _____

4) Would you buy more, the same, or fewer goods and services if the interest rate were unexpectedly raised from 2% to 2.5%?

☐ More

☐ The same

☐ Less

5) Would you save more, the same, or less money if the interest rate were unexpectedly raised from 2% to 2.5%?

☐ More

☐ The same

☐ Less

6) You said that you expect to [buy more/buy the same/buy fewer] goods and services and to [save more/save the same/save less] money because of this event. Could you please explain the reasoning behind your answers, addressing both the change in spending and in saving? Your answer is very important to us. Please include all details you consider relevant.

I expect to [buy more/buy the same/buy fewer] goods and services and to [save more/save the same/save less] money because... _____

5) Sentiment

Do you disagree or agree with the following statements?

1. When I compare myself to my peers (such as family, friends, or neighbors), I generally think I am better off financially.

☐ 1 Completely disagree

☐ 2

☐ 3

☐ 4

☐ 5 Completely agree

2. My economic situation in 12 months will be better than my economic situation today.

☐ 1 Completely disagree

☐ 2

☐ 3

☐ 4

☐ 5 Completely agree

Appendix E LLM-Based Classification of Open-Ended Responses

This appendix describes the procedure used to analyse the open-ended responses collected in Wave 2. All prompts used in the LLM-based analysis are included in the paper’s replication package. The analysis followed a four-step procedure: (1) translation of responses from Dutch to English; (2) inductive construction of a narrative codebook; (3) LLM-based classification of individual responses; and (4) validation of the classification output. Each step is described in detail below.

The procedure was implemented separately for the two open-ended questions included in Wave 2. The first asked respondents to explain the reasoning behind their beliefs about the directional effects of the monetary policy shock on inflation and unemployment. The second elicited explanations for their expected adjustments in consumption and saving following the shock (see Appendix D for the exact wording of the questions).

Step 1: Translation

Since the survey was administered in Dutch, all open-ended responses were translated into English using the Python library `deep_translator`, which relies on the Google Translate API.

Step 2: Inductive Codebook Construction

We developed a codebook of narrative categories inductively from the data. Translated responses were fed to GPT-4o in batches of 100, with instructions to identify recurring themes and economic reasoning patterns. The codebook was refined iteratively across batches until no new substantive categories emerged. This procedure yielded the following narrative categories:

Narratives Explaining Inflation and Unemployment Responses

- **Textbook (demand channel):** Higher rates reduce household borrowing and spending, lowering demand, cooling inflation, and weakening the labour market.
- **Cost channel:** Higher rates raise firms’ financing costs, which are passed on to consumers as higher prices, while reduced investment slows hiring.
- **Wage-price spiral:** Higher rates or a stronger economy prompt wage demands; firms pass higher labour costs onto prices, generating inflationary pressure.
- **Positive signal (information channel):** The rate hike is read as a signal of economic strength, boosting confidence and potentially increasing spending and activity.
- **Negative signal:** The rate hike is read as a sign that the economy is in trouble, generating pessimism and worsening outcomes.
- **External labour market:** Unemployment is driven by structural factors—ageing, automation, immigration, labour shortages—independent of monetary policy.

- **External prices:** Inflation is attributed to global factors—wars, energy prices, supply-chain disruptions—rather than to the ECB decision.
- **Money supply (monetarist):** Higher rates reduce credit creation and the money supply, bringing inflation down through a quantity-theory logic.
- **Monetary policy ineffectiveness:** The respondent explicitly argues that the rate change has little or no effect on inflation or unemployment.
- **Confused:** The stated expectations contradict the respondent’s own reasoning, or the explanation contains a factual error about monetary transmission.
- **No knowledge:** The respondent explicitly states that they do not know or cannot explain the relevant relationships.
- **Residual:** A catch-all for junk or missing responses, and for answers that describe economic outcomes without articulating any causal mechanism.

For the analysis in Section 4.4, all categories other than textbook, cost channel, positive signal, and residual are grouped into a single “*other narratives*” category.

Narratives Explaining Consumption and Saving Responses

- **Substitution saver:** Higher rates increase the return to saving, making delayed consumption more attractive.
- **Income saver:** Interest income on existing assets is now higher, so the respondent feels richer or expects more disposable future resources.
- **Income borrower:** Higher rates increase debt-servicing costs for variable-rate borrowers, squeezing disposable income and reducing both consumption and saving.
- **Precautionary:** Saving increases as a buffer against uncertainty—job-loss risk, economic instability, or higher future borrowing costs—rather than in response to returns.
- **Inflation expectations:** The respondent anticipates higher future inflation following the hike (or reads the hike as a signal of persistent inflation), so they bring consumption forward.
- **Needs:** Consumption and saving are driven by necessity or fixed habits; the respondent does not adjust behaviour in response to the rate change.
- **Monetary policy irrelevance:** The respondent explicitly states that the ECB rate change has no bearing on their personal financial decisions.
- **Small-change irrelevance:** The rate change is perceived as too small to warrant any behavioural adjustment.

- **Purchasing power:** Higher rates erode real income, leaving less to spend or save.
- **Financial buffer:** The respondent’s financial resources are sufficient to absorb the shock; behaviour does not change.
- **Financial constraint:** Limited financial resources prevent any adjustment to spending or saving.
- **No knowledge:** The respondent explicitly states that they do not know or cannot explain how the rate hike affects their behaviour.
- **Residual:** A catch-all for junk or missing responses, and for answers that describe behavioural outcomes without articulating any causal mechanism.

Step 3: Classification Algorithm

Each translated response was classified by a GPT-4o-based algorithm prompted to assign answers to one or more narrative categories, together with a confidence score between 0 and 100. Only classifications with a confidence score of at least 70 were retained; those below the threshold were marked as “Uncertain classification”. Responses could be assigned to multiple categories if more than one narrative exceeded this threshold.

The algorithm was also instructed to evaluate whether the respondent’s reasoning logically supported their stated directional expectations for *both* inflation and unemployment. Each response was assigned one of three values: *True* if the reasoning supported both stated directions; *False* if it contradicted at least one; and *Incomplete* if the reasoning was coherent for one variable but silent or too vague on the other.

Step 4: Validation

The classification output was validated in two ways. First, a second LLM algorithm based on Claude (Sonnet 4.6) independently classified a subset of responses. Second, one of the authors manually reviewed 300 randomly selected responses.

The results of the validation procedures are as follows:

Narratives Explaining Inflation and Unemployment Responses

- Agreement rate between GPT-4o and Claude Sonnet 4.6: 94.4%
- Agreement rate between GPT-4o and human classification: 91.1%

Narratives Explaining Consumption and Saving Responses

- Agreement rate between GPT-4o and Claude Sonnet 4.6: 93.8%
- Agreement rate between GPT-4o and human classification: 95.7%
- Agreement rate between Claude Sonnet 4.6 and human classification: 97.6%