Households' Macroeconomic Beliefs: The Role of Education*

Jessica Piccolo[1], Alessia Russo[2], Eleonora Granziera[3], and Efrem Castelnuovo[4]

[1]University of Padova

[2]University of Padova and CEPR

[3]Norges Bank

[4]University of Padova, CESifo, and CAMA

First version: November 2024 - this version: September 2025

Abstract

We investigate how education shapes households' macroeconomic beliefs by surveying Dutch households on their perceptions and forecasts of inflation, unemployment, mortgage rates, and stock prices. Our findings unveil significant differences between highly educated and less educated households. Highly educated respondents form beliefs consistent with the existence of a monetary policy trade-off between inflation and unemployment, whereas less-educated households adopt a "supply-side" perspective. When exposed to vignette-based scenarios simulating monetary policy shocks, highly educated individuals adjust their beliefs and consumption-saving decisions in line with intertemporal substitution and textbook economic models. In contrast, less-educated respondents often retain pre-existing beliefs

* This working paper should not be reported as representing the views of Norges Bank. We thank Guido Ascari, Aniket Baksy, Regis Barnichon, Cristiano Cantore, Guy Debelle, Giulia Gitti, Pamela Giustinelli, Mikhail Golosov, Pedro Gomis-Porqueras, Yuriy Gorodnichenko, Edoardo Grillo, Alexander Haas, Lukas Hack, Rupal Kamdar, Annamaria Lusardi, Benjamin Moll, Lorenzo Mori, Emi Nakamura, Viet Nguyen, Salvatore Nisticò, Bruce Preston, Federico Ravenna, Daniele Siena, David Sraer, Jon Steinsson, Giovanni Pellegrino, Tiziano Ropele, Benjamin Schoefer, Shang-Jin Wei, and participants to presentations at the "4th Sailing the Macro workshop" (Ortigia), "6th Melbourne Macro Policy workshop", Collegio Carlo Alberto, and the Universities of California at Berkeley and Padova for useful comments and suggestions. Financial support by the European Union - NextGenerationEU (PRIN 2022 on "Inflation: Causes, Consequences, and Policy Implications", CUP: C53D23002650006, project code: 2022A9PAT3 and PRIN 2022 on "Challenges in the National Governance of the Environment", CUP: H53D23008400001, project code: P2022L7T42) is gratefully acknowledged. Study registered in the AEA RCT Registry (identifying number: AEARCTR-0014917). The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the Norges Bank. Authors' accounts: jessica.piccolo.1@phd.unipd.it, alessia.russo@unipd.it, eleonora.granziera@norges-bank.no, efrem.castelnuovo@unipd.it . Corresponding author: Alessia Russo, Department of Economics and Management, via del Santo 33, 35123 Padova (PD), Italy.

or revise them using non-standard mental models. Moreover, highly educated households primarily rely on formal education and newspapers for economic information, while less-educated households are more influenced by social media. These findings point to the need to model education-related heterogeneity and communicate policy targets and decisions in a simplified manner to reach different socio-economic groups.

Keywords: Households' expectations, subjective models, survey data, monetary policy.

JEL codes: E31, E52, E58.

1 Introduction

Motivation. How do agents form beliefs about inflation and unemployment? A recent but fast-growing strand of the literature has relied on survey data to address this question and documented a substantially cross-sectional heterogeneity among households, firms, and professionals (see, for example, Coibion et al., 2018b, 2020, Weber et al., 2022, Ropele et al., 2024). Particular attention has been posed to households' expectation formation over future inflation and its connection with monetary policy (Coibion et al., 2022, D'Acunto and Weber, 2024, D'Acunto et al., 2024). Understanding how households form their beliefs and the drivers of their heterogeneity is essential for developing macroeconomic frameworks to design optimal monetary policy (Woodford, 2003, Sims, 2003, Galí, 2008, Eusepi and Preston, 2018).

This paper contributes to the literature by examining the role of education as a key driver of heterogeneity in household beliefs. Recent studies highlight education as a factor that reduces households' upward bias in inflation expectations (D'Acunto et al., 2022, Fofana et al., 2024), yet its broader role in shaping belief formation remains insufficiently explored. Given that individuals' understanding of economic mechanisms is likely influenced by personal knowledge of the functioning of the economy, it is reasonable to expect education to be a significant determinant of belief heterogeneity. Previous research has shown substantial differences in beliefs among individuals with varying IQ levels or income (D'Acunto et al., 2023), traits that are often correlated with education. However, education offers the distinct advantage of being both easily observable and directly addressable through policy interventions. Therefore, identifying whether education serves as a critical dimension of heterogeneity in how individuals conceptualize the economy is an important area of investigation. This paper contributes in this area.

What we do. We study how education shapes households' beliefs about the macroeconomy. Using a tailored survey of 1,500 Dutch respondents, we elicit both unconditional expectations—on inflation, unemployment, and mortgage rates—and conditional expectations about how inflation, unemployment, and the stock market respond to hypothetical monetary policy shocks. Following Andre et al. (2022), we use carefully crafted vignettes to ensure all respondents receive identical information about the shock and prevailing macroeconomic conditions. By holding information constant, we isolate heterogeneity in beliefs that stems from differences in economic reasoning rather than differences in information

sets (e.g., Mankiw and Reis, 2002, Reis, 2006, Coibion and Gorodnichenko, 2012).

Findings: Unconditional beliefs. We document several novel patterns in households' unconditional beliefs that highlight the importance of education in shaping macroeconomic understanding.

First, we document that educated individuals form more accurate expectations: they are less likely to report extreme values and make smaller forecast errors for inflation, unemployment, and mortgage rates.

Second, education emerges as a key predictor of how households perceive the inflation–unemployment trade-off. We measure the "Phillips correlation" by regressing expected changes in inflation on expected changes in unemployment, where both are defined as the difference between one-year-ahead forecasts and current perceptions. This approach isolates beliefs about future dynamics while controlling for individual-specific factors. We replicate the well-documented finding that expected inflation and unemployment are positively correlated across individuals (e.g., Bhandari et al., 2024, Candia et al., 2020). The positive correlation suggests that, on average, households associate rising inflation with a weakening labor market—consistent with a supply-side view in which inflation reflects adverse shocks rather than overheating demand. However, this average masks substantial heterogeneity: the positive correlation is concentrated among respondents without a college degree. Among college-educated individuals, by contrast, the Phillips correlation is negative—more consistent with a demand-driven interpretation and an understanding of the trade-off faced by monetary policy. This result highlights education as a central dimension of heterogeneity in how households interpret one of the core relationships in macroeconomics. The finding is robust to controls for age, income, employment status, household composition, sentiment, and other demographics. Notably, the same regression using expectations from the ECB's Survey of Professional Forecasters yields a negative correlation, suggesting that more educated households reason in ways more closely aligned with expert views.

Third, we examine the correlations between expected changes in mortgage rates, inflation, and unemployment. As expected, households anticipate mortgage rates to rise with inflation—a pattern consistent with Taylor-rule logic, in which policy rates respond to inflation and pass through to borrowing costs (Carvalho and Nechio, 2014). However, we also find a positive correlation between expected changes in mortgage rates and unemploy-

ment, which is inconsistent with the Taylor rule. One interpretation is that households view rising mortgage costs as contributing to a broader deterioration in economic conditions—possibly through their impact on disposable income and sentiment—especially in a high-interest-rate environment like that prevailing at the time of our survey. Unlike the Phillips correlation, these patterns do not vary systematically with education: both high- and low-educated respondents exhibit similar beliefs. Moreover, when we replicate the analysis using expectations from professional forecasters, we find that these correlations are not statistically significant—reflecting a lack of clear consensus even among experts on the direction of these relationships.

Findings: Conditional beliefs. We analyze households' responses to a monetary policy shock using a hypothetical vignette embedded in the survey. For each respondent, we construct subjective impulse responses by comparing expectations under the hypothetical scenario to unconditional expectations elicited at the beginning of the survey. This yields individual-level IRFs for inflation, unemployment, and stock prices. We then classify households based on the joint signs of their expected responses across these three outcomes. We define several distinct belief types. Households whose responses mirror standard New Keynesian predictions—expecting both lower inflation and higher unemployment following a policy tightening—are labeled as holding *textbook* mental models (e.g., Smets and Wouters, 2007). A second group anticipates rising inflation alongside falling output, consistent with *cost channel* models where interest rate hikes raise firms' marginal costs and hence prices (Christiano et al., 2005, Ravenna and Walsh, 2006). A third group expects both inflation and output to rise, suggesting an *information channel* interpretation in which rate hikes signal stronger fundamentals (e.g., Campbell et al., 2012, Nakamura and Steinsson, 2018, Miranda-Agrippino and Ricco, 2021). Beyond these theory-consistent patterns, we identify belief types that deviate from standard macroeconomic models. Households expecting one variable to remain unchanged are classified as *stubborn*, while those expecting neither inflation nor unemployment to respond are labeled *super-stubborn*. Finally, households who anticipate a decline in inflation coupled with an improvement in real activity fall into a *residual model* category that does not align with existing theories.

We regress model classifications on respondents' educational attainment, controlling for a rich set of socioeconomic characteristics. We find that households with a college degree are significantly more likely to hold mental models consistent with standard macroeconomic frameworks—whether textbook, cost channel, or information channel. By contrast, respon-

dents without a college degree are disproportionately concentrated in the residual model category, which departs from commonly accepted interpretations found in macroeconomic models.

Expectations matter insofar as they guide household behavior. To examine this link, we ask respondents how they would adjust their spending and saving in response to the hypothetical monetary policy shock. Here too, we find systematic differences by education. College-educated respondents are more likely to report that they would reduce spending and increase saving—consistent with intertemporal substitution and optimal consumption smoothing in response to a negative shock. In contrast, less educated households are more likely to indicate that they would increase spending and reduce saving. This pattern is harder to reconcile with standard theory, unless one interprets reported "spending" as a reflection of unavoidable expenditures driven by cost-of-living pressures rather than discretionary consumption.

Possible Channels. The final part of the paper explores potential mechanisms through which education shapes households' interpretation of macroeconomic relationships. Our goal is not to establish causality, but to provide suggestive evidence on why educational attainment is such a strong predictor of theory-consistent and economically informed beliefs.

First, education is correlated with economic exposure. More educated respondents are more likely to own a home, hold financial assets, possess private insurance, and are less likely to have a mortgage. These patterns suggest that they may have stronger personal stakes in macroeconomic outcomes and therefore greater incentives to understand how the economy works.

Second, belief formation appears to differ systematically in terms of information sources. More educated individuals report relying primarily on traditional and formal channels—such as their own educational background and newspapers—whereas less educated respondents rely more heavily on social media and informal networks.

We are also able to rule out some plausible channels. The field of study, for example, does not appear to play a meaningful role: respondents with a background in economics are no more likely to interpret Phillips curve trade-offs or policy shocks in a theory-consistent way, once overall education level is accounted for.

Policy and modeling implications. Our findings have both modeling and policy

implications. From a modeling standpoint, our paper stresses the need to embed economic knowledge-related heterogeneity in monetary policy frameworks, a call similar to the one done by (Lusardi and Mitchell, 2023) regarding households with different degrees of financial literacy. Financial literacy and education are positively correlated, possibly the outcome of an optimal choice by households who have to deal with more complex portfolios to manage and savings decisions for retirement (Lusardi et al., 2017). Consistently, Calvet et al. (2009) find that better-educated Swedish households hold more stocks than the less-educated, and that achieves lower non-systematic risk on their portfolios conditional on holding stocks. Kaplan et al. (2014) find that households who are not hand-to-mouth have on average two more years of education with respect to poor hand-to-mouth households. Embedding human capital formation via households' decisions to invest in financial literacy in heterogenous agents models appears to be a promising way to offer a microfoundation to poor hand-to-mouth ("rule-of-thumb") consumers in two-agent models à la Galí et al. (2007), Bilbiie (2008, 2020, 2024), Debortoli and Gali' (2024)) and Debortoli and Gali' (2024), as well as to 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., 2023). Another fruitful avenue seems to be that of combining standard rational expectations models, which could be representative of highly educated agents' thinking, with models of households' "supply-side" view à la Kamdar and Ray (2024), Bhandari et al. (2024), Zhang (2024), and Gonçalves Raposo (2025), whose beliefs formation might be more in line with that of low-educated households. This approach enables researchers to strike a balance between incorporating macroeconomic expectations documented by survey evidence (Moll (2024)) and maintaining a rigorous aggregation of heterogeneous behaviors across households.

From a policy standpoint, our paper confirms that economic knowledge may significantly affect the formation of households' beliefs and actions after a monetary policy shock. Heterogenous responses of households to monetary policy shocks may reduce the efficacy of monetary policy (Baldassarri et al. (2024)) and generate wealth inequality (Lusardi and Mitchell, 2023).[1] Interventions to increase the level of financial literacy in the population and reduce heterogeneity in economic and financial knowledge are desirable and have been increasingly implemented in various countries. Courses in personal finance have been

[1] Lusardi et al. (2017) find imperfect financial knowledge to imply meaningful welfare losses. According to their estimates, consumers would be willing to give up about 3 percent of period consumption over their lifetimes to live in a world with perfect financial knowledge.

taught at different levels across the world (Lusardi and Mitchell, 2023). On top of what Governments and supranational institutions such as e.g. the European Commission and the OECD have done, many central banks and institutions have launched outreach programs aimed at reducing financial illiteracy.[2] Turning to policy institutions, an effort to simplify policy communication in an attempt to reach a wider fragment of the population has also been undertaken (see, e.g., Haldane and McMahon, 2018, Coibion et al., 2022, Blinder et al., 2024). Our findings support these efforts and point to a non-traditional source of information - social media - as a possible vehicle to inform citizens about easily accessible educational programs.

Our paper is structured as follows. Section 2 describes the survey. Section 3 documents our empirical findings based on unconditional moments. Section 4 moves to our vignette and documents the changes in beliefs that are triggered by our hypothetical monetary policy shock. Moreover, it offers a mapping between such beliefs and existing interpretative models and relates such views of the macroeconomy to education. Section 5 characterizes highly educated people. Section 6 draws connections between our contribution and the extant literature. Section 7 concludes.

2 Data and design

The LISS panel. 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 11 annual or bi-annual survey modules investigating household economic and family status, as well as health information, personality traits, and beliefs. 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

[2] Examples include, among many others, the "FedEd" launched by the Federal Reserve (https://www.federalreserve.gov/aboutthefed/educational-tools/fed-education.htm) and the "Money and Me" program of the Bank of England (https://www.bankofengland.co.uk/education/education-resources/money-and-me).

the rich household-level information from the LISS Core Study, enabling to conduct of heterogeneous analyses across various dimensions, such as respondents' economic status, personality traits, values, and political ideologies.

Sample. In May 2024, we recruited a sample of 1,500 respondents. As shown in Table 1, our sample closely mirrors the Dutch population in terms of key demographic characteristics—such as gender, age, income, and educational attainment—when compared to the Dutch central bank's Household Survey (DNB Household Survey).

The survey was completed on the LISS Panel's online platform. To ensure data quality in the empirical analysis, we restrict the sample based on respondents' survey behavior. We exclude individuals whose total completion time falls below the 5th percentile of the overall distribution—likely reflecting insufficient attention—as well as those who took more than 48 hours to complete the questionnaire, to minimize the risk of forgetting definitions and information presented at the start. These filters help retain a sample of sufficiently engaged respondents and align with common practices in the literature (e.g., (Colarieti et al., 2024)). The final sample consists of 1,318 individuals, representing 85% of the original pool. Among them, the median completion time was 13 minutes and 28 seconds, and 91% completed the survey within one hour. To limit the impact of outliers, we apply a winsorizing procedure to the point forecasts of inflation and unemployment reported in the survey: observations above the 95th percentile are set equal to the 95th percentile value. This method preserves the full sample while reducing the influence of extreme responses and is commonly employed in survey research to improve the robustness of descriptive and regression analyses (e.g., Kim and Binder (2023)). Our findings remain robust when alternative data cleaning practices (censoring) are applied.

Structure of the survey. Figure 1 presents a graphical representation of the survey design. The survey begins with an introduction that includes two questions designed to gauge respondents' sentiment, their optimism about the future of their personal finances compared to their own situation in the past and relative to their peers. The first part of the questionnaire focuses on respondents' perceptions and expectations regarding the three primary macroeconomic variables: year-on-year CPI inflation, unemployment, and mortgage rate on new loans. Measuring expectations for three of the most relevant macroeconomic variables within the same survey enables the test for joint expectation formation rather than independent ones (see also Coibion and Gorodnichenko, 2012). In other words,

combining expectations of different macroeconomic variables enables us to gain insights into the mental models households appeal to when they have to think about the structure of the economy (or part of it, e.g., the Phillips curve). Respondents are provided with non-technical definitions of each variable; subsequently, they are asked to estimate its current value and predict its value in 12 months' time. Asking both the perception (how is the variable today compared to 12 months ago) and what the variable is predicted to be in 12-month time allows us to measure accuracy in the perception, which can be considered a proxy for how informed they are about the macroeconomic environment. Perceptions are also useful for capturing households's knowledge of variable-specific trends. To control for information exposure, we directly inquire about the main sources of information influencing respondents' knowledge of each macroeconomic variable.

The second part of the survey presents all participants with economic vignettes featuring a hypothetical yet realistic scenario describing the occurrence of a monetary policy shock that involves an unexpected change in the policy rate. Respondents are randomly assigned to one of two groups, one exposed to negative shocks (i.e., an increase in the policy rate) and the other one to positive ones (a monetary policy easing). The randomization is performed by the LISS Panel. The two groups are statistically similar in terms of demographics such as gender, employment status, family size, education, homeownership, debt status, and income.

For each scenario, respondents are tasked to provide an estimate on one-year ahead inflation and unemployment rates. Comparing households' beliefs on future inflation and unemployment before and after exposure to the hypothetical shock scenario enables us to quantify the impact of the hypothetical monetary policy shocks controlling for heterogeneity in the information set. Moreover, to distinguish pure policy shocks from information shocks, we inquire about respondents' expectations regarding changes in stock prices, which positively correlate with tightening monetary and fiscal policies in the presence of information shocks (Jarociński and Karadi, 2020, Miranda-Agrippino and Ricco, 2021). Finally, we investigate how monetary policy shocks matter for households' intentions over economic decisions and actions; therefore we ask whether in the hypothetical scenarios described, they would consider making changes in some of their current economic choices (spending, saving).

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 holding a

Bachelor's degree in the Dutch education system.[3] Throughout the analysis, we capture educational heterogeneity using a binary indicator that distinguishes between respondents with above- and below-median educational attainment. This definition separates those with a college degree or higher from those without, regardless of their field of study.

In all main regression specifications, we include a rich set of covariates drawn from the LISS Core Study module, which provides detailed background information on respondents' socioeconomic conditions. Specifically, we control for the number of children, net household income, employment status, homeownership, economic sentiment (measured both with respect to one's own situation and that of peers), and a comprehension score derived from the placebo vignette. Robustness checks further account for asset holdings (e.g., financial assets, private insurance, mortgage status), political orientation (on a 0–10 left–right scale), and self-employment status. Importantly, these controls are not elicited in our survey module but come from the regularly updated LISS Core Study, allowing us to shorten survey length, reduce respondent fatigue, and mitigate measurement error in key background variables.

3 Unconditional moments

Unconditional expectations. The first part of the survey collects perceptions and prior expectations on inflation, unemployment, and the mortgage rate on new loans. Given the relevance of households' beliefs formation for macroeconomic modelling, let us focus on households' priors. Figure 2 documents the distribution of such priors across our respondents. The inflation density displays: (i) a wide dispersion in households' forecasts; (ii) positive right-skewness; (iii) a mean value clearly above the one of professional forecasters, here proxied by the Dutch National Bank's. These three facts are stylized facts in this literature (D'Acunto et al., 2024, Granziera et al., 2025). Notably, the magnitude of the bias is about 1.2% in our sample, as documented by Table 2. This figure belongs to the range documented by previous studies, which suggest that household inflation expectations can exceed professional forecasts by 1-3 percentage points (Carroll, 2003, Armantier et al., 2016, Coibion et al., 2018a), possibly because of a downward-biased memory of past prices that leads them to overestimate current and future inflation (Bordalo et al., 2017, D'Acunto

[3]For a description of the Dutch school system, see Appendix C.

and Weber, 2022). Our estimate of the inflation expectations bias is not particularly high due to the arguably higher attention posed by households on inflation given the relatively high numbers due to the pandemic (Weber et al., 2024, Link et al., 2024).

Turning to the density of the unemployment rate, we notice a milder bias (about 0.5%), the presence of a lower degree of positive skewness, a dispersion much milder than that of inflation. 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) whose perception can also depend by idiosyncratic elements, for instance, the fact of being a mortgagor or not (Bolhuis et al., 2024). Along these lines, it is perhaps not too surprising that the dispersion across households' estimates on mortgage rates is even lower, and we also notice a negative degree of skewness 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 bias concerning unemployment beliefs; (iii) point to an even less dispersed distribution across households as far as mortgage rates are concerned. While these facts are of interest *per se*, the joint collection of these expectations (and the corresponding perceptions) enables us to attempt an understanding on how households think of basic macroeconomic relationships. This is what we turn to next.

Education and the likelihood of extreme expectations. We begin by assessing whether the distribution of unconditional expectations varies systematically with education, specifically by testing whether education is associated with a lower likelihood of reporting extreme point estimates in macroeconomic expectations. Figure 3 presents the estimated coefficients from regressions where the dependent variable is a dummy equal to one if a respondent's point estimate lies in the upper tail—i.e., above the 95th percentile—for each of the three variables: inflation, unemployment, and mortgage rates.[4] The key explanatory variable is our binary indicator for high education. Results show that more educated individuals are significantly less likely to report extreme values of expectations and perceptions for all three macroeconomic indicators (with the sole exception of

[4]Here, we refer to the whole distribution, before the winsorization described in section 2

the expectations for mortgage rates, where the coefficient is not significant). Overall, these findings indicate that more educated respondents are less likely to be in the tails of the distribution.

Forecast Accuracy by Education. We next examine whether education correlates with greater accuracy in macroeconomic expectations. For each respondent, we compute a forecast error defined as the absolute difference between their unconditional expectation and the realized value of the relevant variable in May 2025 in the Netherlands: 2.9% for inflation, 3.8% for unemployment, and 3.5% for mortgage rates. Figure 4 presents the coefficients from regressions of these absolute forecast errors on the high education dummy, controlling for standard sociodemographic characteristics. The results indicate that highly educated individuals make significantly smaller forecast errors for both unemployment and mortgage rates. The effect for inflation, however, is not statistically significant—possibly reflecting lingering uncertainty in the aftermath of the 2022 inflation spike, which may have affected households' ability to form accurate expectations regardless of education.

Expected changes in macroeconomic indicators. Since our survey measures both perceptions and expectations, we can compute the respondent-specific expected changes of the three variables of our interest, i.e., inflation, unemployment, and mortgage rates, as follows:

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

where $z \in \{\pi, u, r\}$, and the objects in the triplet are, respectively, inflation, unemployment, and the mortgage rate.[5] Importantly, subtracting perceptions of the variable of interest allows us to purge idiosyncratic differences stemming from individuals' varying interpretations of the economic concept, for example. We combine these changes to understand households' view(s) of the macroeconomic environment.

Phillips correlation. One key reference in macroeconomics is the Phillips correlation between unemployment and inflation, which is often documented by regressing inflation over unemployment (Kamdar, 2019, Reis and Watson, 2010, Stock and Watson, 2020).

[5]Figure **??** illustrates the correlation between priors and perceptions for inflation, unemployment, and mortgage rates. While the correlations across all three items are high, consistent with findings in Weber et al. (2022), the figures reveal significant dispersion, particularly for inflation. This pattern aligns with Ropele et al. (2024), who document a decoupling between perceptions and expectations during periods of elevated inflation, such as the one preceding the interviews for this survey.

A stylized fact in the survey literature is that households tend to associate high inflation with high unemployment—a pattern often interpreted as a supply-side view of the economy (D'Acunto et al., 2024, Binetti et al., 2024). We replicate this pattern in our data, but show that it masks meaningful heterogeneity by education.

Figure 5 (left-panel) presents a binned scatter plot of cross-sectional inflation changes versus unemployment changes.[6] Importantly, we plot expected changes (differences between priors and perceptions) to draw information from the data about the slope of the supply curve—something that would not be possible when focusing on priors only. The scatter plot points to a positive Phillips correlation. Regressions reported in Table 3 confirm that this positive coefficient is robust to the inclusion of a vector of controls. The pattern also holds when we use qualitative answers—where respondents indicate whether the variables are increasing, decreasing, or remaining unchanged relative to current levels—thereby reducing sensitivity to outliers in numerical responses.

Importantly, this aggregate pattern conceals meaningful heterogeneity across education levels, suggesting that households with different formal training interpret inflation-unemployment dynamics through fundamentally different lenses. Figure 5 (right-panel) shows that the previous scatter plot masks sharply divergent belief patterns. Among respondents without a college degree, the Phillips coefficient remains positive. In contrast, college-educated households report expectations consistent with a negative relationship between inflation and unemployment. These correlations remain robust even after controlling for a variety of covariates and when using qualitative responses instead of quantitative ones for priors and perceptions, as shown in Table 3;[7] the use of qualitative responses also helps rule out the possibility that the observed correlations are driven by outliers. The negative correlation among more educated households aligns with a textbook view of the monetary policy trade-off. [8]

At first glance, our evidence of a steep Phillips correlation in expectations may appear at odds with recent findings on a flat Phillips curve in aggregate macro data. However, the two are not necessarily inconsistent. First, beliefs about the inflation-unemployment

[6]For the scatterplot, refer to Figure **??** in the Appendix.

[7]Table **??** shows that the results are robust to additional controls, including asset ownership, borrowing status, political orientation, and field of study.

[8]By contrast, Ferreira and Pica (2024) do not find education to be a significant determinant of expectations in six European countries. However, their analysis focuses on changes in cross-sectional aggregates, not on individual-level expectation revisions.

relationship may reflect theoretical knowledge of core macroeconomic trade-offs, such as a downward-sloping Phillips curve, regardless of recent aggregate outcomes. Second, most empirical studies documenting a flattening of the Phillips curve focus on pre-pandemic data, while our survey was fielded in May 2024, in the post-pandemic environment. Interestingly, Cerrato and Gitti (2024) and Gitti (2024) find evidence of a steepening Phillips curve during the pandemic, driven by tight labor markets and cost pass-through. Third, recent contributions have pointed to demand shocks as the dominant driver of the 2021–2023 inflation episode (see, e.g., Giannone and Primiceri, 2024, Mori, 2024, Ascari et al., 2024). All else equal, large demand shocks—such as the expansive fiscal and monetary responses to the COVID crisis—facilitate the identification of a supply curve in both structural models (Barnichon and Mesters, 2020) and reduced-form evidence (Lepetit et al., 2023). Taken together, this suggests that beliefs in a Phillips curve that is "alive and well" —especially among highly educated households—may reflect both theoretical reasoning and recent macroeconomic experience.

As an additional benchmark, we compare household beliefs to those of professional forecasters. Specifically, we use data from the 2024Q2 wave of the ECB Survey of Professional Forecasters (SPF), which was fielded contemporaneously with our household survey. The SPF elicits expectations for inflation and unemployment at various horizons; to match the 12-month forecast horizon in our household data, we use professional forecasts for inflation and unemployment in 2025Q2. While the SPF does not collect current perceptions (i.e., nowcasts), we approximate expected changes by subtracting the actual values of inflation and unemployment observed in 2024Q2—under the assumption that professional forecasters are aware of current economic conditions. We then replicate our baseline analysis and regress expected changes in inflation on expected changes in unemployment using the SPF sample. The results, shown in Figure 6 (left panel), reveal a negative and statistically significant coefficient. This finding reinforces our interpretation: college-educated households perceive a trade-off between inflation and unemployment in a manner consistent with professional forecasters, while less educated households exhibit a belief structure more detached from standard macroeconomic models.

Mortgage rate and macroeconomic aggregates. Having analyzed households' beliefs about the inflation–unemployment trade-off, we now turn to another key macroeconomic relationship: the Taylor rule, which describes how interest rates respond to inflation

and real activity. To explore this, we examine survey data on expected changes in mortgage rates and how these relate to expectations about inflation and unemployment. Figure 7 presents these relationships as binned scatterplots:[9] the left panel plots the correlation between expected changes in mortgage rates and inflation, while the right panel shows the correlation with unemployment.

We observe positive and statistically significant correlations in both cases: households that expect positive changes inflation also expect positive changes in mortgage rates, and similarly, those expecting rising unemployment anticipate rising mortgage costs. These results are confirmed in the regression analysis reported in Table 4. The patterns are robust across both quantitative and qualitative response formats and—importantly—do not vary systematically with education. In contrast to our findings on the Phillips correlation, we do not detect statistically significant differences between more and less educated households. These belief patterns therefore appear to characterize the household population as a whole, rather than reflecting heterogeneity by formal education.

How should we interpret these correlations? The positive relationship between expected changes in mortgage rates and inflation is in line with a Taylor rule interpretation, where households expect the policy rate—and thus mortgage rates—to rise in response to inflation. However, the positive correlation between changes in mortgage rates and unemployment is not consistent with a standard Taylor-rule mechanism. Interestingly, both patterns are in line with the empirical findings of Carvalho and Nechio (2014), who analyze U.S. households using Michigan Survey data. Their results suggest that households associate interest rate increases with recessions during periods of strong labor market performance, when the central bank is perceived as reacting preemptively to inflation. Our survey was conducted in May 2024, when the Dutch unemployment rate stood at 3.6%—well below its two-decade average of 5.8%. Our findings may thus reflect a similar mechanism.

An alternative explanation draws on the role of mortgage rates in shaping households' cost of living and economic sentiment. Bolhuis et al. (2024) provide international evidence that rising mortgage rates directly affect perceived living costs, and show that changes in mortgage rates are strongly and negatively correlated with the component of consumer sentiment not explained by official inflation and unemployment data. If sentiment influences expectations about unemployment, their framework may also explain the positive

[9]For the scatterplot, refer to Figure **??** in the Appendix.

correlation we observe between changes in mortgage rates and unemployment. This interpretation is particularly relevant in economies with a high share of households holding adjustable-rate mortgages—such as the Netherlands (Baldassarri et al., 2024).

Finally, we turn to professional forecasters to assess whether similar correlations appear in expert data. As shown in the center and right panels of Figure 6, the correlations between expected changes in mortgage rates and either inflation or unemployment are weak and statistically insignificant. The scatterplots are highly dispersed, indicating a lack of clear consensus even among experts on the direction of these relationships. In this context, it is perhaps not surprising that households—regardless of education—do not form theory-consistent beliefs about the link between interest rates and macroeconomic outcomes. When professional forecasters themselves hold diverse views, the absence of alignment among households, including the highly educated, may simply reflect the genuine ambiguity surrounding this aspect of monetary transmission.

4 Households' beliefs and monetary policy shocks

Vignette. How do households change their beliefs about the evolution of the macroeconomic environment in response to a monetary policy shock? We address this question by working with a hypothetical scenario via a "vignette" that simulates an unexpected policy move by the European Central Bank to our respondents and recording their beliefs over the one-year-ahead realizations 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 is designed to meet the criteria outlined by Ramey (2016) for identifying macroeconomic shocks—namely, exogeneity and surprise. We frame the policy intervention as exogenous by explicitly stating that the interest rate change occurs in the absence of any other major economic developments. To ensure the shock is perceived as unanticipated, we describe it as occurring "unexpectedly" within the vignette.

To capture potential asymmetries in belief formation, we randomly assign respondents to one of two treatments: half are exposed to a hypothetical increase in the policy rate of 50 basis points, while the other half face a hypothetical decrease of the same magnitude.

In both cases, the pre-shock interest rate is set at 4.5%, matching the level of the main refinancing operations rate of the European Central Bank in May 2024, when the survey was conducted.

The size of the shock is set to 50 basis points. This corresponds to a shock of approximately 7 standard deviations based on estimates from Euro area data. For instance, consider the VAR model of Badinger and Shiman (2023), who identify monetary policy shocks using a narrative approach. When we re-estimate their model using year-on-year CPI inflation and the unemployment rate—our variables of interest, replacing the CPI in log-levels and the unemployment level in their original specification—we obtain a median standard deviation of monetary policy shocks equal to 7 basis points. A similar estimate is reported by Jarociński and Karadi (2020). While sizable, the shock we simulate remains within the historical range of observed policy actions. Figure **??** displays the distribution of ECB policy rate changes since 1999, showing that the 50 basis point adjustment used in our vignette falls well within the range of empirically observed policy moves. Overall, the goal is to present respondents with a large—but still credible—policy shock: one that is unexpected and salient enough to elicit a reaction, while not being perceived as implausible or unrealistic.

The vignette is followed by questions regarding three different macroeconomic indicators:

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

"How to 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" because they represent beliefs formed *after* being exposed to the hypothetical monetary policy shock. We contrast them with households' priors, which are beliefs formed *before* the vignette. Given that the only difference in households' information set when formulating their priors vs. posteriors is the information about the policy change provided by the vignette, the difference between the posterior and the prior is providing us with information on how households assess the impact of a monetary policy shock on future inflation and unemployment, i.e., the impulse

response functions of households' beliefs regarding these two variables[10].

Formally, we compute households' beliefs on the impulse responses of inflation and unemployment as follows:

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

where $z \in \{\pi, u\}$.[11] In Table 5, we test for the symmetric effects of positive and negative shocks and find no evidence supporting asymmetry. Consequently, we reverse the sign of the responses in the case of monetary easing, and from now onward, we refer to monetary policy shocks as monetary tightening.

IRFs and mental models. What mental models do households rely on when evaluating the effects of a monetary policy shock like the one presented in our vignette? To address this question, we classify respondents based on the joint signs of their impulse responses (IRFs) for inflation and unemployment, as shown in Figure 8. These sign combinations are then mapped—when possible—onto known macroeconomic frameworks. Table 8 summarizes this classification, and Figure 9 visualizes the distribution across groups.

Households can be divided into distinct categories depending on the direction of their expected responses.[12] First, 14% of respondents display IRF 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, 2003, 2007). We refer to this group as the *textbook* category.

The largest group—24% of the sample—reports a combination of rising inflation and rising unemployment. These beliefs align with cost-channel models of monetary policy transmission, in which higher interest rates raise firms' marginal costs due to working

[10]Conditional on this vignette, all respondents have comparable information sets, which enables us to appreciate heterogeneity in households' beliefs driven by their subjective models as opposed to, say, information frictions (see, e.g., Coibion and Gorodnichenko, 2012).

[11]For inflation and unemployment, we ask quantitative questions on households' beliefs about these variables in 12 months. For inflation, unemployment, and stock prices, we also ask qualitative questions on how prices of goods and services, companies hiring and layoffs and stock prices would change after such a shock. For inflation and unemployment, we combine quantitative answers pre and post-vignette. In Table 6, we verify the significant and positive correlation between quantitative and qualitative impulse responses of inflation and unemployment. We will instead employ qualitative answers to the impact of monetary policy shocks on stock prices as a selection device for mental models later.

[12]The probability of being assigned to each mental model cathegory under random guessing is derived in Appendix B. The empirical frequencies in our data differ substantially from these benchmark probabilities, suggesting that respondents are not simply guessing at random.

capital requirements or cash-in-advance constraints (i.e., Barth and Ramey, 2001, Ravenna, 2007, Christiano et al., 2005). An alternative interpretation draws from the cost-of-living hypothesis proposed by Bolhuis et al. (2024), which links rising mortgage rates to higher inflation perceptions and more pessimistic labor market expectations. We classify these households as the *cost channel* group.

A smaller group, comprising 9% of respondents, anticipates that a monetary tightening leads to both higher inflation and stronger economic activity. These responses are consistent with information channel models, in which agents interpret policy tightening as a signal of central bank confidence in future economic conditions (e.g., Campbell et al., 2012, Melosi, 2017, Nakamura and Steinsson, 2018, Jarociński and Karadi, 2020, Miranda-Agrippino and Ricco, 2021). We label this group the *information channel* category.

Overall, approximately 47% of respondents provide answers that are interpretable within the sign structure of well-established macroeconomic models—whether textbook, cost-channel, or information-channel frameworks.

How about the remaining respondents? 9% of the respondents believe that both inflation and unemployment will decrease in response to an unexpected increase in the policy rate. This negative correlation is not common in macroeconomic models of monetary policy: We then term *residual* the mental models these households have in mind. Several theoretical mechanisms could, in principle, rationalize a negative comovement between inflation and unemployment in response to a monetary policy tightening, as reported by households in the residual group. One possibility involves search-theoretic models in which money is essential for transactions in decentralized markets characterized by frictions such as matching inefficiencies or limited commitment. In such settings, lower inflation (e.g., via the Fisher relationship) raises the real balances held by agents, thereby reducing the cost of trading and increasing the frequency and efficiency of exchanges. This, in turn, boosts firms' labor demand and reduces unemployment (see, e.g., Lagos et al., 2017). However, these models typically generate a positive short-run correlation between policy rates and both inflation and unemployment—unlike the negative correlation we observe in the residual group. An alternative interpretation draws on the "new-Fisherian" view, which posits that raising nominal interest rates can be expansionary and inflationary if the rate increase is gradual, persistent, and anticipated—particularly when accompanied by stable fiscal policy (Cochrane, 2017). Yet this mechanism hinges on expectations of future monetary policy paths, and is inconsistent with the design of our vignette, which presents the shock as an

immediate and unexpected rate hike.[13].

Remarkably, close to 44% of the households in this survey believe that either inflation or unemployment would not change in response to a monetary policy shock, while about 8% believe that neither inflation nor unemployment would be affected. This result is in line with recent findings by Binetti et al. (2024), who also document households' resistance to change their beliefs when faced with a policy rate change.

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 in June 2024.[14] A 25 basis points cut materialized in June 2024. This would imply a more powerful impact of the vignette proposing an unexpected policy rate *increase* of 50 basis points. Regressions reported in Table 5 that test for the possibly larger effect of interest rate increases proposed by our vignette failed to support this theoretical argument. 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 respondent's own expectation of the change in the mortgage rate, $\Delta \mathbb{E}^i_{r,t+1}$, which we compute as the difference between their unconditional expectation and their perception of the current mortgage rate—both elicited at the beginning of the survey:[15]

$$\text{Surprise} \equiv \left| \pm 0.5 - \Delta \mathbb{E}^i_r \right|$$

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 is driven by prior expectations about actual monetary policy moves, we would expect respondents with Surprise ≈ 0 to be more likely to exhibit stubborn behavior—that is, to expect no effect of the policy shock on inflation or unemployment. However, regression presented in table 7 reveals no significant association between the degree of surprise and the likelihood of being classified as stubborn.

[13]For an empirical comparison of the new-Fisherian mechanism with the information channel, see Schmitt-Grohé and Uribe (2024)

[14]see e.g., https://www.reuters.com/markets/rates-bonds/ecb-rate-cut-case-getting-stronger-says-chief-economist-lane-2024-05-06/

[15]While our survey does not include post-vignette expectations for mortgage rates, 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).

Monetary policy shocks and stock prices. How do households think of the response of the stock market to a monetary policy shock? Can we exploit their views to further test the interpretative models reported in Table 8? Figure 10 documents the sign of the change in stock prices associated by households to an unexpected hike in the policy rate. On aggregate, 33% of Dutch households believe that such a shock would generate a stock market bust, a prediction in line with standard monetary policy frameworks. As much as 18% think that monetary policy shocks are irrelevant to the stock market, and 49% of the respondents point to a stock market boom, which would be consistent with e.g., the information channel view. Once again, we document a pretty heterogeneous view of the functioning of the economy (in this case, of financial markets) across households.

This evidence can be employed at a household level to refine the association between beliefs of impulse responses and interpretative models. Table 9 reports the shares of the three textbook models (textbook, cost channel, information channel) that "survive" the further refinement due to the joint imposition of signs on the impulse responses of inflation, unemployment, and stock prices, and contrasts it with the one previously obtained by imposing the signs on the first two macro indicators only. By construction, all three shares decline, with a marked drop for the info channel mental model (3.57%, from 9.41%) and a sizeable one both for the textbook view of the business cycle effects of monetary policy shocks (7.44%, from 13.81%) and the cost channel one (13.58%, from 24.13%). We will then work with so-selected households, among which the stubborn and super-stubborn ones identified before, to assess the role played by education. The results remain robust even when using a less restrictive model classification that does not require the stock market response to a monetary policy shock to have consistent signs.

Mental models: Role of education. Is there any connection between education and the way households interpret the economy? Figure 11 reports the coefficients of a linear probability model (top panel) and of a multinomial probit (bottom panel) where the dependent variable is a dummy variable equal to one if a household is associated with a specific mental model (e.g., for the textbook model, the indicator equals one when a household is classified under the standard model and zero otherwise). Belonging to the highly educated group increases by 2.8% the likelihood of interpreting the macroeconomic environment via a

standard model, and by 4.3% that of referring to a cost channel framework.[16] Interestingly, low-educated respondents are instead associated with a higher likelihood of referring to our catchall residual model category (3.9%). No significant effect is detected as far as the group of stubborn respondents is concerned. The results are robust to the inclusion of a wide set of covariates.[17] The effects we describe are also economically significant. Table 10 shows that having a college degree increases the probability of belonging to the textbook group by 51%, to the cost channel group by 37%, and decreases the probability of belonging to the residual group by 36%. Overall, being highly educated goes hand-in-hand with thinking of the economy in a textbook way (either via a standard AD/AS model of some sort, or via a cost channel framework). Differently, non-standard beliefs on the macroeconomic effects of monetary policy shocks are more likely to be those of low-educated households.

Actions and education. What would households do after a monetary policy shock? Our survey asks this question and proposes alternatives regarding spending and savings. Respondents can indicate if they would increase, decrease, of leave spending and savings unchanged. The top panel of Figure 12 reports the coefficients of a regression linking actions to education, controlling for demographics and prior expected change in the mortgage rates. Highly educated households are more likely to increase savings and decrease spending after a monetary policy tightening. While such households feature savvy financial behavior, low-educated people have a significantly large probability of behaving against the predictions of standard consumption/savings frameworks, i.e., they are estimated to have a probability of decreasing savings 6.4% larger and increasing spending 4.2% larger than highly educated people. This is problematic because it increases the likelihood of financial hardship for households that are already low-income. In this sense, our results are in line with the findings in Lusardi and Mitchell (2014, 2023), who point to the sub-optimality of economics choices by low-literate households.

[16]The estimated effect of education on the likelihood of belonging to the information channel group is negative. However, once we impose the additional requirement that expectations about stock prices also align with the theoretical model, the size of this group shrinks to just 47 respondents. As a result, the estimates should be interpreted with caution due to limited sample size.

[17]The vector of controls includes: number of children, net income, employment status, homeownership status, economic sentiment, a comprehension score from the placebo vignette, and a randomization dummy. We also control for the change in the expected mortgage rate (i.e., the difference between prior and perceived values) to account for any anticipation of the shock described in the vignette.

5 Effect of Education: Possible Channels

This final part of the paper explores potential mechanisms that may explain why educational attainment plays such a central role in shaping households' understanding of the macroeconomy. While we do not aim to establish causality, our goal is to provide suggestive evidence on the channels through which education influences the ability to interpret macroeconomic relationships and to respond coherently to monetary policy shocks. Leveraging the rich detail of our survey data, we examine several dimensions along which highly educated individuals may differ from their less educated counterparts in ways that matter for belief formation and economic behavior.

Asset holding. One possible explanation is that more educated individuals have greater incentives to be informed about macroeconomic dynamics because they are more exposed to them in their personal financial lives. Our data support this idea: the bottom panel of Figure 12 presents results from regressions in which the dependent variables are indicators for asset holdings, and the key explanatory variable is education, controlling for the usual set of sociodemographic characteristics. We find that more educated respondents are significantly more likely to own a home, hold financial assets, and possess private insurance, and are less likely to have a mortgage. These patterns suggest that higher-educated individuals may have stronger personal stakes in macroeconomic developments—such as interest rate changes or inflation—and thus greater motivation to understand how the economy works.[18]

Interpretation of hypotetical scenarios. A second possible channel is that more educated individuals may simply be better equipped to interpret complex economic scenarios. The reasoning and abstraction skills developed through higher education may make them more capable of processing hypothetical situations, such as those presented in our monetary policy vignette. To explore this idea, our survey includes a placebo vignette designed to indirectly test respondents' ability to interpret an economic scenario and filter out irrelevant information. Specifically, before the monetary policy vignette, all respondents are shown a brief text describing a seemingly plausible, yet economically irrelevant, shock:

[18]Importantly, our main findings remain robust to controlling for these characteristics, indicating that the role of education is not merely a proxy for economic exposure

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

We then ask respondents how this event would affect the Dutch economy—specifically, firm costs, household expenditure, consumer prices, and unemployment—offering them three response options for each: increase, decrease, or no change. Since the shock should have no direct effect on the Dutch economy,[19] a correct interpretation implies recognizing its irrelevance.[20] Based on their answers, we construct a placebo score (ranging from 0 to 4), assigning one point for each "no change" response. A high score reflects a better ability to interpret hypothetical economic scenarios and resist the urge to see consequences where there are none; a low score suggests a tendency to overattribute effects to unrelated events.

Figure 13 shows that while a majority of respondents (about 60%) score relatively high, all possible scores are observed—pointing to considerable heterogeneity in interpretative ability. Importantly, as shown in Table 11, the placebo score is positively and significantly correlated with educational attainment. This supports the view that education enhances the cognitive tools required to correctly evaluate hypothetical macroeconomic scenarios—potentially explaining why more educated individuals are also more likely to adopt theory-consistent beliefs in response to monetary policy shocks.

Sources of information. Another plausible channel behind the gap in macroeconomic reasoning between more and less educated individuals lies in the sources of information they rely on to form their beliefs. If different groups systematically refer to different information environments, this could naturally lead to diverging interpretations of macroeconomic events. Figure 14 presents regression estimates linking educational attainment to the likelihood of citing various information sources used when forming inflation expectations. The results show that highly educated respondents are significantly more likely to report relying on newspapers and economic knowledge—whether acquired through formal education or informal learning—as primary sources. In contrast, less educated respondents are significantly more likely to cite social media as an information source. These differ-

[19] The Netherlands does trade in copper ore, with an import (export) equal to 0.25% (0.15%) of real GDP in 2022, which makes the country the 27th largest importer (80th largest exporter) in the world (source: https://oec.world/en/profile/bilateral-product/copper-ore/reporter/nld). For comparison, the Netherlands' imports (exports) of refined petroleum in 2022 were 5.10% (6.80%).

[20] On the other hand, a "general equilibrium" take involving the reaction of the copper market at the world level might suggest a reduction of the cost of companies and the price of goods for households. Hence, we compute our placebo score by assigning a value equal to one both to the "no change" answers and to the "down" answers as far as the cost of companies and the price of goods are concerned.

ences in informational inputs may help explain why education is such a strong predictor of theory-consistent beliefs and macroeconomic understanding.

Ruling out domain-specific education. A natural hypothesis is that the strong role of education in shaping macroeconomic beliefs may be driven primarily by formal training in economics. To investigate this possibility, we construct a dummy variable equal to one for respondents who majored in economics in their most recent degree, regardless of the degree level. We then test whether this specific background contributes to heterogeneity in key results. First, when examining beliefs about the Phillips correlation (Table 12), we find no significant differences between individuals with and without an economics background. Column 2 of the table shows that even the coefficient on the triple interaction—capturing respondents who are both highly educated and trained in economics—is statistically insignificant. Similarly, when we use the economics field dummy to predict group membership in the interpretative categories derived from the vignette (i.e., textbook, cost-channel, information-channel, residual), we again find no evidence of significant differences (Figure 15). These results suggest that it is not domain-specific training in economics that drives the more theory-consistent responses of highly educated individuals, but rather a broader set of skills or cognitive traits associated with higher general education.

6 Connection with the literature

The paper closest to ours is Andre et al. (2022). They use vignettes to elicit households' and experts' beliefs about macroeconomic variables such as inflation and unemployment to four macroeconomic shocks (monetary policy, Government spending, tax rate, oil), They also find dispersion across households' responses and provide evidence of associative memory's role as a possible driver of households' heterogeneous beliefs. With respect to them, we: (i) focus on education and unveil its role behind households' beliefs formation; (ii) explore also households' beliefs regarding the reaction of stock prices to macroeconomic shocks, which is relevant information that we exploit to support (or reject) beliefs formation in line with supply-side channels such as the cost channel and the information channel; (iii) collect unconditional beliefs about mortgage rates, which we exploit to check the consistency of households' beliefs formation with the cost-of-living hypothesis; (iv) rely only on structured questions, which have a variety of advantages with respect to open-text questions, such

as ease of comparability across respondents; easier connection with fully identified transmission channels; lower effort by the respondents, which may limit measurement error; absence of the need by the researcher to interpret the respondents' answers, which would induce subjectivity in the collected data; (v) propose a placebo vignette, which we use in our regressions as a control for idiosyncratic biases; (vi) exploit the rich set of household background information connected to our survey data to explore how households' socioeconomic situation, personality and values influence their interpretation of macroeconomic shocks and their transmission mechanisms.

A related paper is Binetti et al. (2024), who study how variations in policy instruments (e.g., changes in the interest rate and government spending) and changes in oil prices can affect inflation and unemployment. They also investigate drivers of heterogeneity across households and find political leaning to be a distinct one, with Democrats (Republicans) more likely to associate inflation with inequality (Government policies and negative economic outcomes). Knotek et al. (2024) run multi-wave randomized control trials to test the effects of real-world monetary policy actions on consumers' expectations during and in the aftermath of the pandemic inflation occurrence. Isolating respondents who were unaware of policy actions and are sufficiently attentive to the treatments, they find monetary policy communications around positive changes in interest rates to reduce long-run inflation expectations. With respect to these two papers, we use vignettes to *exogenous* changes in the policy rate from its systematic response to macroeconomic conditions and single out the role of education as a driver of households' heterogeneous beliefs.

Our respondents' beliefs regarding the changes in inflation, unemployment, and stock prices after a monetary policy shock are extremely heterogeneous from a quantitative standpoint and cover both positive and negative realizations. This evidence confirms the substantial disagreement in macroeconomic expectations often found in the literature (Mankiw et al., 2003, Coibion and Gorodnichenko, 2015, Link et al., 2023, Giglio et al., 2021). This is problematic because disagreement implies a difficult management of the transmission of macroeconomic policy impulses (Ball et al., 2005, Paciello and Wiederholt, 2014, Angeletos and Lian, 2017). To some extent, our evidence is complementary to the one put forth by Lewis et al. (2020), who work with survey data and show that monetary policy announcements can shift households' macroeconomic expectations, above all those of highly educated respondents (Baldassarri et al., 2024). On the other hand, a larger share of our respondents do not change their beliefs after being exposed to our vignette. Our findings,

which regard inflation, unemployment, and stock prices, complement and expand those by Binetti et al. (2024), who document the reluctance of respondents to vary their inflation beliefs after experimental interventions.

As anticipated in the Introduction, our paper links education to textbook concepts such as the Phillips correlation and the models for the transmission of monetary policy shocks. As pointed out by Lusardi and Mitchell (2014, 2023), financial literacy and education are strictly correlated. Hence, our results square with those in the literature surveyed by those two papers, e.g., inflation is better understood by people possessing a college degree (or above). Lusardi and Mitchell (2023) document a number of survey-based facts connecting households' understanding of the economy and financial and economic choices to their education level. Among the other facts, they document a positive correlation between the score assigned to respondents who correctly address their "big three" questions on financial literacy (i.e., questions about nominal returns on savings, the role of inflation for real returns on financial investment, and portfolio risk-diversification) and education. In particular, they document a striking difference between highly educated (college and above) respondents' understanding of the basic principles of financial economics and low-educated ones, with consequences on a variety of dimensions (e.g. different returns of a financial portfolio). In this respect, we document a positive correlation between education and the score associated with our placebo questions. Our results are also consistent with those in Malmendier and Nagel (2016), who find that sophistication and experience are positively correlated with a good understanding of inflation.

As discussed, recent contributions have documented the positive correlation in terms of households' expectations between inflation and unemployment (see e.g. Meeks and Monti, 2023, Bhandari et al., 2024, Kamdar and Ray, 2024, Zhang, 2024, Gonçalves Raposo, 2025). We also find this unconditional correlation in beliefs and document that it extends to stock prices, i.e., some households expect inflation, unemployment, and the stock market to correlate positively. Our vignette approach allows us to identify the monetary policy shock as one of the drivers of this comovement.

7 Conclusions

This paper surveys Dutch households and documents their expectation formation over inflation, unemployment, stock prices, and mortgage rates both unconditional and after hypothetical monetary policy shocks simulated via vignettes. We combine households' beliefs to understand if the mental models they appeal to when thinking about the macroeconomy are associated with textbook models or more exotic ones. Our main finding is that education draws a clear line separating highly-educated households and low-educated respondents. Low-educated households think of inflation as being "bad", i.e., they have a supply-side view of the economy. This evidence, which represents a regularity in the literature, is overturned when considering highly educated households, who form beliefs consistent with a downward-sloping Phillips curve that implies a monetary policy trade-off. Highly educated households also form beliefs over the macroeconomic effects of monetary policy shocks in line with textbook models (traditional AD/AS models, cost-channel models, information channel models). Differently, less-educated respondents adjust their beliefs using non-standard mental models. These beliefs formation is associated with different actions after the hypothetical monetary policy shock: highly educated households increase precautionary savings, while low-educated ones state they would reduce savings and increase spending. Our findings suggest that differences in asset exposure and cognitive ability help explain why education shapes how households understand the macroeconomy. Interestingly, highly educated households refer to their background or newspapers as their main sources of information, while low-educated ones use social media to get informed.

From a modeling standpoint, our analysis suggests embedding education choices/endogenous human capital formation in business cycle models of monetary policy featuring heterogenous frameworks, therefore merging endogenous choices of investment in financial literacy as in Lusardi et al. (2017) in TANK or HANK models. Policywise, in line with Haldane and McMahon (2018), Coibion et al. (2022), Blinder et al. (2024), our findings call for simpler policy communications, which may be more effective in affecting low-educated households' expectations and decisions. Possibly, the use of social media could have a large multiplier to convey information about policy targets and decisions.

References

Acharya, Sushant, Edouard Challe, and Keshav Dogra (2023) "Optimal Monetary Policy According to HANK," *American Economic Review*, 113(7), 1741–1782.

Altavilla, Carlo, L. Brugnolini, R. Gürkaynak, R. Motto, and G. Ragusa (2019) "Measuring Euro Area Monetary Policy," *Journal of Monetary Economics*, 108, 162–179.

Andre, Peter, Carlo Pizzinelli, Christopher Roth, and Johannes Wohlfart (2022) "Subjective Models of the Macroeconomy: Evidence From Experts and Representative Samples," *Review of Economic Studies*, 89, 2958–2991.

Angeletos, George-Marios and Chen Lian (2017) "Dampening General Equilibrium: From Micro to Macro," NBER Working Paper No. 23379.

Armantier, O., S. Nelson, and G. Topa (2016) "Household Inflation Expectations and Consumer Behavior: Evidence from Panel Data," *American Economic Journal: Macroeconomics*, 8(1), 1–40.

Ascari, Guido, Dennis Bonam, Lorenzo Mori, and Andra Smadu (2024) "Fiscal Policy and Inflation in the Euro Area," CEPR Discussion Paper No. 19683.

Auclert, Adrien (2019) "Monetary Policy and the Redistribution Channel," *American Economic Review*, 109(6), 2333–2367.

Auclert, Adrien, Matthew Rognlie, and Ludwig Straub (2023) "The Intertemporal Keynesian Cross," *Journal of Political Economy*, forthcoming.

Badinger, Harald and Stefan Shiman (2023) "Measuring Monetary Policy in the Euro Area Using SVARs with Residual Restrictions," *American Economic Journal: Macroeconomics*, 15(2), 279–305.

Baldassarri, Lorenzo, Dimitris Georgarakos, Geoff Kenny, and Justus Meyer (2024) "Monetary policy transmission to households: The importance of consumers' attention to interest rates and financial literacy," available at https://cepr.org/voxeu/columns/monetary-policy-transmission-households-importance-consumers-attention-interest-rates.

Ball, L., G.N. Mankiw, and R. Reis (2005) "Monetary Policy for Inattentive Economies," *Journal of Monetary Economics*, 52, 703–725.

Barnichon, Regis and Geert Mesters (2020) "Identifying Modern Macro Equations with Old Shocks," *Quarterly Journal of Economics*, 135(4), 2255–2298.

Barth, M.J. and V. Ramey (2001) "The Cost Channel of Monetary Transmission," in: Bernanke, B. and Rogoff,K. (eds), NBER Macroeconomics Annual 2001 (Cambridge, MA: MIT Press) (16), 199–240.

Bhandari, Anmol, Jaroslav Borovika, and Paul Ho (2024) "Survey data and subjective beliefs in business cycle models," *Review of Economic Studies*, forthcoming.

Bilbiie, Florin O. (2008) "Limited Asset Market Participation, Monetary Policy and (Inverted)Aggregate Demand Logic," *Journal of Economic Theory*, 140(1), 162–196.

——— (2020) "The New Keynesian Cross," *Journal of Monetary Economics*, 114, 90–108.

——— (2024) "Monetary Policy and Heterogeneity: An Analytical Framework," *Review of Economic Studies*, forthcoming.

Binetti, Alberto, Francesco Nuzzi, and Stefanie Stantcheva (2024) "People's understanding of inflation," *Journal of Monetary Economics*, forthcoming.

Blinder, Alan S., Michael Ehrmann, Jakob De Haan, and Davis-Jan Jansen (2024) "Central Bank Communication with the General Public: Promise or False Hope?" *Journal of Economic Literature*, 62(2), 425–457.

Bolhuis, Marijn A., J.N.L. Cramer, K.O. Schulz, and Lawrence H. Summers (2024) "The Cost of Money is Part of the Cost of Living: New Evidence on the Consumer Sentiment Anomaly," NBER WP No. 32163.

Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer (2017) "Memory, Attention, and Choice," *Quarterly Journal of Economics*, 135(3), 1399–1442.

Calvet, L., J. Campbell, and Paolo Sodini (2009) "Measuring the Financial Sophistication of Households," *American Economic Review: Papers & Proceedings*, 99(2), 393–398.

Campbell, Jeffrey R., Charles L. Evans, Jonas D.M. Fisher, and Alejandro Justiniano (2012) "Macroeconomic Effects of Federal Reserve Forward Guidance," *Brookings Papers on Economic Activity*, 42(1), 1–80.

Candia, Bernardo, Olivier Coibion, and Yuriy Gorodnichenko (2020) "Communication and the Beliefs of Economic Agents," NBER Working Paper No. 27800.

Carroll, Chris D. (2003) "Macroeconomic Expectations of Households and Professional Forecasters," *Quarterly Journal of Economics*, 118(1), 269–298.

Carvalho, Carlos and Fernanda Nechio (2014) "Do people understand monetary policy?" *Journal of Monetary Economics*, 66, 108–123.

Cerrato, Andrea and Giulia Gitti (2024) "Inflation Since COVID: Demand or Supply," University of California at Berkeley and Collegio Carlo Alberto Turin, mimeo.

Christiano, L.J., M. Eichenbaum, and C.L. Evans (2005) "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy," *Journal of Political Economy*, 113(1), 1–45.

Cochrane, John H. (2017) "Michelson- Morley, Fisher, and Occam: The Radical Implications of Stable Quiet Inflation at the Zero Bound," in: Martin Eichenbaum and Jonathan A. Parker (eds.): NBER Macroeconomics Annual (32), 113–226.

Coibion, O., Y. Gorodnichenko, and R. Kamdar (2018a) "The Formation of Expectations, Inflation, and the Phillips Curve," *Journal of Economic Literature*, 56(4), 1447–1491.

Coibion, Olivier and Yuriy Gorodnichenko (2012) "What Can Survey Forecasts Tell us about Information Rigidities?" *Journal of Political Economy*, 120, 116.159.

——— (2015) "Is the Phillips Curve Alive and Well after All? Inflation Expectations and the Missing Disinflation," *American Economic Journal: Macroeconomics*, 7, 197–232.

Coibion, Olivier, Yuriy Gorodnichenko, and Saten Kumar (2018b) "How Do Firms Form Their Expectations? New Survey Evidence," *American Economic Review*, 108, 2671–2713.

Coibion, Olivier, Yuriy Gorodnichenko, and Tiziano Ropele (2020) "Inflation Expectations and Firm Decisions: New Causal Evidence," *Quarterly Journal of Economics*, 135, 165–219.

Coibion, Olivier, Yuriy Gorodnichenko, and Michael Weber (2022) "Monetary Policy Communications and Their Effects on Household Inflation Expectations," *Journal of Political Economy*, 130(6), 1537–1584.

Colarieti, Roberto, Roberto, Pierfrancesco Mei, and Stefanie Stantcheva (2024) "The how and why of household reactions to income shocks,"Technical report, National Bureau of Economic Research.

D'Acunto, Francesco, Evangelos Charalambakis, Dimitris Georgaratos, Geoff Kenny, Justus Meyer, and Michael Weber (2024) "Household Inflation Expectations: An Overview fo Recent Insights for Monetary Policy," Becker Friedman Institute for Economics Working Paper No. 2024-66.

D'Acunto, Francesco, D. Hoang, M. Paloviita, and M. Weber (2023) "IQ, Expectations, and Choice," *Review of Economic Studies*, 90(5), 2292–2325.

D'Acunto, Francesco, Ulrike M. Malmendier, and Michael Weber (2022) "What Do the Data Tell Us About Inflation Expectations," In: R. Bachmann, G. Topa, and W. van der Klaauw (eds.), Handbook of Economic Expectations, Elsevier, November.

D'Acunto, Francesco and Mchael Weber (2022) "Memory and Beliefs: Evidence from the Field," mimeo.

D'Acunto, Francesco and Michael Weber (2024) "Why Survey-Based Subjective Expectations are Meaningful and Important," *Annual Review of Economics*, forthcoming.

Debortoli, Davide and Jordi Gali' (2024) "Heterogeneity and Aggregate Fluctuations: Insights from TANK Models," BSE Working Paper No. 1436.

D'Acunto, Francesco, Evangelos Charalambakis, Dimitris Georgarakos, Geoff Kenny, Justus Meyer, and Michael Weber (2024) "Household inflation expectations: An overview of recent insights for monetary policy," NBER Working Paper No. 32488.

Eusepi, Stefano and Bruce Preston (2018) "The Science of Monetary Policy: An Imperfect Knowledge Perspective," *Journal of Economic Literature*, 56(1), 3–59.

Ferreira, Clodomiro and Stefano Pica (2024) "Household perceived sources of business cycle fluctuations: A tale of supply and demand," Bank of Italy Working Paper No. 1441.

Fofana, S., Paula Patzelt, and Ricardo Reis (2024) "Household Disagreement about Expected Inflation," in: G. Ascari and R. Trezzi (Eds.:): "Research Handbook of Inflation", Edward Elgar Publishing, forthcoming.

Galí, Jordi (2008) *Monetary Policy, Inflation and the Business Cycle*: Princeton University Press. Princeton, New Jersey.

Galí, Jordi, Javier López-Salido, and Javier Vallés (2007) "Understanding the Effects of Government Spending on Consumption," *Journal of the European Economic Association*, 5, 227–270.

Giannone, Domenico and Giorgio Primiceri (2024) "The Drivers of Post-Pandemic Inflation," NBER Working Paper No. 32859.

Giglio, S., M. Maggiori, J. Stroebel, and S. Utkus (2021) "Five Facts about Beliefs and Portfolios," *American Economic Review*, 111, 1481–1522.

Gitti, Giulia (2024) "Nonlinearities in the Regional Phillips Curve with Labor Market Tightness," Collegio Carlo Alberto Turin, mimeo.

Gonçalves Raposo, Inês (2025) "Inflation Expectations, Wages and On-the-Job Search," mimeo, available at https://inesgraposo.github.io/.

Granziera, Eleonora, Lovisa Reiche, Nicolò Maffei-Faccioli, Michael Weber, and Tuva Marie Fastbø (2025) "Five Facts about Inflation Expectations: Evidence from Four Different Groups of Agents," Norges Bank wp 7/25.

Haldane, Andrew and Michael McMahon (2018) "Central Bank Communications and the General Public," *American Economic Review Papers & Proceedings*, 108, 578–583.

Jarociński, Marek and Peter Karadi (2020) "Deconstructing Monetary Policy Surprises: The Role of Information Shocks," *American Economic Journal: Macroeconomics*, 12(2), 1–43.

Kamdar, Rupal (2019) "The Inattentive Consumer: Sentiment and Expectations," 2019 Meeting Papers 647, Society for Economic Dynamics.

Kamdar, Rupal and Walker Ray (2024) "Attention-Driven Sentiment and the Business Cycle," Indiana University and London School of Economics, available at https://sites.google.com/view/rupalkamdar/home.

Kaplan, Greg, Benjamin Moll, and Giovanni L. Violante (2018) "Monetary Policy According to HANK," *American Economic Review*, 108(3), 697–743.

Kaplan, Greg, Giovanni L. Violante, and Justin Weidner (2014) "The Wealthy Hand-to-Mouth," *Brookings Papers on Economic Activity*, Spring, 77–138.

Kim, Gwangmin and Carola Binder (2023) "Learning-through-Survey in Inflation Expectations," *American Economic Journal: Macroeconomics*, 15, 254–278.

Knotek, Edward S., J. Mitchell, M. Pedemonte, and T. Shiroff (2024) "The Effects of Interest Rate Increases on Consumers' Inflation Expectations: The Roles of Informedness and Compliance," Inter-American Development Bank Working Paper No. 1641.

Lagos, Ricardo, Guillaume Rocheteau, and Randall Wright (2017) "Liquidity: A New Monetarist Perspective," *Journal of Economic Literature*, 55(2), 371–440.

Lepetit, Antoine, Francesco Furlanetto, Ørjan Robstad, Juan Rubio-Ramírez, and Pål Ulvedal (2023) "Estimating Hysteresis Effects," *American Economic Journal: Macroeconomics*, forthcoming.

Lewis, Daniel J., Christos Makridis, and Karel Mertens (2020) "Do Monetary Policy Announcements ShiftHousehold Expectations?", Federal Reserve Bank of New York Staff Reports No. 897.

Link, Sebastian, Andreas Peichl, Oliver Pfäuti, Christopher Roth, and Johannes Wohlfart (2024) "Attention to the Macroeconomy," mimeo, available at https://sites.google.com/site/chrisrotheconomics.

Link, Sebastian, Andreas Peichl, Christopher Roth, and Johannes Wohlfart (2023) "Information frictions among firms and households," *Journal of Monetary Economics*, 135, 99–115.

Lusardi, Annamaria, Pierre-Carl Michaud, and Olivia S. Mitchell (2017) "Optimal Financial Knowledge and Wealth Inequality," *Journal of Political Economy*, 125(2), 431–477.

Lusardi, Annamaria and Olivia S. Mitchell (2014) "The Economic Importance of Financial LIteracy: Theory and Evidence," *Journal of Economic Literature*, 52(1), 5–44.

——— (2023) "The Importance of Financial Literacy: Opening a New Field," *Journal of Economic Perspectives*, 37(4), 137–154.

Malmendier, Ulrike and Stefan Nagel (2016) "Learning from Inflation Experiences," *Quarterly Journal of Economics*, 131(1), 53–87.

Mankiw, G.N. and Ricardo Reis (2002) "Sticky Information Versus Sticky Prices: A Proposal to Replace the New Keynesian Phillips Curve," *Quarterly Journal of Economics*, 117, 1295–1328.

Mankiw, G.N., Ricardo Reis, and J. Wolfers (2003) "Disagreement About Inflation Expectations," NBERMacroeconomics Annual, (18), 209–248.

Meeks, Roland and Francesca Monti (2023) "Heterogeneous Beliefs and the Phillips Curve," *Journal of Monetary Economics*, 139, 41–54.

Melosi, Leonardo (2017) "Signalling Effects of Monetary Policy," *Review of Economic Studies*, 84(2), 853–884.

Miranda-Agrippino, Silvia and Giovanni Ricco (2021) "The Transmission of Monetary Policy Shocks," *American Economic Journal: Macroeconomics*, 13(3), 74–107.

Moll, Benjamin (2024) "The Trouble with Rational Expectations in Heterogeneous Agent Models: A Challenge for Macroeconomics," London School of Economics, mimeo, available at https://benjaminmoll.com/.

Mori, Lorenzo (2024) "Fiscal Shocks and the Surge of Inflation," University of Padova, available at https://sites.google.com/view/lorenzomori/.

Nakamura, Emi and J. Steinsson (2018) "High-Frequency Identification of Monetary Non-Neutrality: The Information Effect," *Quarterly Journal of Economics*, 133(3), 1283–1330.

Paciello, Luigi and Mirko Wiederholt (2014) "Exogenous Information, Endogenous Information, and Optimal Monetary Policy," *Review of Economic Studies*, 81, 356–388.

Ramey, Valerie A. (2016) "Macroeconomic Shocks and Their Propagation," in: J.B. Taylor and H. Uhlig (Eds.): Handbook of Macroeconomics, Volume 2, Elsevier Science, 71–162.

Ravenna, F. and C. Walsh (2006) "Optimal Monetary Policy with the Cost Channel," *Journal of Monetary Economics*, 53, 199–216.

Ravenna, Federico (2007) "Vector Autoregressions and Reduced Form Representations of DSGE Models," *Journal of Monetary Economics*, 54, 2048–2064.

Reis, Ricardo (2006) "Inattentive Consumers," *Journal of Monetary Economics*, 53, 1761–1800.

Reis, Ricardo and Mark W. Watson (2010) "Relative Goods' Prices, Pure Inflation, and the Phillips Correlation," *American Economic Journal: Macroeconomics*, 2(3), 128–157.

Ropele, Tiziano, Olivier Coibion, and Yuriy Gorodnichenko (2024) "Inflation Expectations and Misallocation of Resources: Evidence from Italy," *American Economic Review: Insights*, 6(2), 246–261.

Schmitt-Grohé, Stephanie and Martín Uribe (2024) "Central Bank Information and Neo-Fisher Effect?", NBER Working Paper No. 33136.

Sims, Christopher (2003) "Rational Inattention and Monetary Economics," in: B.M. Friedman and M. Wooford (Eds.): Handbook of Monetary Economics, 3, 155-181.

Smets, F. and R. Wouters (2003) "An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area," *Journal of the European Economic Association*, 1, 1123–1175.

——— (2007) "Shocks and Frictions in US Business Cycle: A Bayesian DSGE Approach," *American Economic Review*, 97(3), 586–606.

Stock, J.H. and M.W. Watson (2020) "Slack and cyclically sensitive inflation," *Journal of Money, Credit, and Banking*, 52(S2), 393–428.

Weber, Michael, Bernardo Candia, Hassan Afrouzi et al. (2024) "Tell me something I don't already know: Learning in low and high-inflation settings," *Econometrica*, forthcoming.

Weber, Michael, Francesco D'Acunto, Yuriy Gorodnichenko, and Olivier Coibion (2022) "The Subjective Inflation Expectations of Households and Firms: Measurement, Determinants, and Implications," *Journal of Economic Perspectives*, 36(3), 157–184.

Woodford, M. (2003) *Interest and Prices: Foundations of a Theory of Monetary Policy*: Princeton University Press. Princeton, New Jersey.

Zhang, Yifan (2024) "Rational Inattention Choices in Firms and Households," University of Oxford, available at https://www.yifanzhang.io/research.

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

Table 1: **Summary statistics: Covariates in the general population samples.** Comparison between the distributions of individual characteristics in our survey with those in the sample of the Dutch National Bank Household Survey.

	Inflation	Unemployment	Mortgage rates
Mean	5.175	5.395	4.242
Median	4	4.5	4
Mode	3	5	4
SD	3.67	3.26	1.44
Skewness	1.292	1.614	.70
Kurtosis	3.946	5.385	4.324
Normality test p-value	0	0	0
May 2024	2.7	3.6	3.8
May 2025	2.9	3.8	3.5
DNB's projections	2.8	4	2.2
Difference test pvalue	0	0	0

Table 2: **Prior expectations: Summary statistics.** Moment comparison across different macroeconomic indicators regarding households' expectations at a one-year ahead horizon. DNB: Dutch National Bank's estimates. Normality test: Shapiro-Wilk test for normality. Difference test: t-test comparing the mean values of households' densities with DNB's estimate (the null hypothesis assumes equality).

	$\Delta E\pi$	$\Delta E\pi$	$\Delta E\pi$	$\Delta E\pi$
ΔEu	0.284**	0.403***		
	(0.118)	(0.102)		
Education	-0.530***	-0.253**	-0.240***	-0.102**
	(0.103)	(0.109)	(0.0446)	(0.0496)
Education $\times$ ΔEu	-0.428**	-0.496***		
	(0.169)	(0.165)		
ΔEu			0.151***	0.162***
			(0.0440)	(0.0449)
Education $\times$ ΔEu			-0.230***	-0.246***
			(0.0712)	(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

Table 3: **Regression of expected change in inflation on expected change in unemployment**. Numerical variables: *Prior - Perception*. Categorical variables: indicator equal to one if inflation/unemployment expected to increase, equal to zero if inflation/unemployment expected not to change, and equal to minus one if inflation/unemployment expected to decrease. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo. Huber-White standard errors in parentheses. */**/*** refer to p-values lower than 0.10/0.05/0.01, respectively.

	ΔEi	ΔEi	ΔEi	ΔEi	ΔEi	ΔEi	ΔEi	ΔEi
$\Delta E\pi$	0.176***	0.152***						
	(0.036)	(0.037)						
Education	-0.100**	0.026	-0.116***	-0.057	-0.179***	-0.004	-0.190***	-0.080*
	(0.043)	(0.047)	(0.041)	(0.047)	(0.047)	(0.049)	(0.041)	(0.048)
Education $\times$ $\Delta E\pi$	-0.047	-0.039						
	(0.041)	(0.042)						
$\Delta E\pi$			0.301***	0.265***				
			(0.035)	(0.036)				
Education $\times$ $\Delta E\pi$			0.082	0.078				
			(0.051)	(0.053)				
ΔEu					0.119**	0.138**		
					(0.059)	(0.069)		
Education $\times$ ΔEu					-0.110	-0.120		
					(0.070)	(0.080)		
ΔEu							0.027	0.017
							(0.038)	(0.039)
Education $\times$ ΔEu							-0.052	-0.059
							(0.065)	(0.066)
Controls	N	Y	N	Y	N	Y	N	Y
R-squared	0.114	0.156	0.154	0.180	0.024	0.099	0.019	0.085
Observations	1318	1237	1318	1237	1318	1237	1318	1237
Variables	Numerical	Numerical	Categorical	Categorical	Numerical	Numerical	Categorical	Categorical

Table 4: **Regression of expected change in mortgage interest rates on expected change in inflation and on expected change in unemployment.** Numerical variables: *Prior - Perception*. Categorical variables: indicator equal to one if mortgage rates/inflation/unemployment expected to increase, equal to zero if mortgage rates/inflation/unemployment expected not to change, and equal to minus one if mortgage rates/inflation/unemployment expected to decrease. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo. Huber-White standard errors in parentheses. */**/*** refer to p-values lower than 0.10/0.05/0.01, respectively.

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

Table 5: **Symmetry between the monetary tightening scenario and the monetary easing scenario.** Dependent variable: IRF of inflation (column 1) and IRF of unemployment (column 2) obtained by reversing the sign of responses in the case of monetary easing. We eliminate the tails of the distributions of the two variables (below 16th percentile and above 84th percentile) to avoid the influence of outliers. Regressor of interest: dummy equal to 1 if the respondent is part of the randomized group who was 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.

	IRF π sign	IRF u sign
IRF π categorical	0.0400	
	(0.0343)	
IRF u categorical		0.440***
		(0.0391)
Controls	Y	Y
R-squared	0.010	0.126
Observations	1237	1237

Table 6: **Correlation between sign of numerical IRFs and categorical IRFs.** Results of regressions analyzing the relationship between the sign of numerical IRFs and categorical IRFs. The dependent variable in each regression is the sign of the numerical IRF, defined as 1 if the IRF is positive, 0 if it is zero, and -1 if it is negative. The key regressor of interest is the corresponding categorical IRF, derived from survey responses: for inflation, 1 indicates "increase," 0 indicates "no change," and -1 indicates "decrease"; for unemployment, 1 indicates "in response of this situation, companies will fire more people," 0 indicates "no change," and -1 indicates "in response of this situation, companies will hire more people". Huber-White standard errors in parentheses. */**/*** refer to p-values lower than 0.10/0.05/0.01, respectively.

	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

Table 7: **Test for exogeneity of the shock.** The dependent variable is a dummy equal to 1 if the respondent is classified as *stubborn*—i.e., if at least one of the impulse responses (inflation or unemployment) to the monetary policy shock is reported as zero. The main explanatory variable is a measure of 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, $\mathbb{E}^i[\Delta r]$, computed as the difference between their unconditional expectation and their perception of the current rate (both elicited at the beginning of the survey). The regressions use a series of dummy variables equal to 1 if the respondent's surprise is exactly zero (Column 1) or falls within increasingly wide intervals around zero (Columns 2-4: ± 1, ± 10, ± 25 basis points). The goal is to test whether respondents who anticipated the shock (i.e., with low surprise) are more likely to be stubborn. All coefficients are statistically insignificant, providing no support for this hypothesis. Robust (Huber–White) standard errors are reported in parentheses.

		IRFπ_{sign}		
		< 0	$= 0$	> 0
IRFu_{sign}	< 0	Residual models: 8.57%	Stubborn: 4.55%	Info channel: 9.41%
	$= 0$	Stubborn: 9.03%	Super stubborn: 7.66%	Stubborn: 14.8%
	> 0	Standard: 13.81%	Stubborn: 8.04%	Cost channel: 24.13%

Table 8: **Households' mental models: Classification conditional on the sign of the impulse responses of inflation and unemployment to an unexpected monetary policy tightening.** Responses to unexpected policy easings bunched with those of the policy tightening. The variables in rows and column are the signs of the numerical IRFs.

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%

Table 9: **Households' mental models: Refinement of textbook models conditional on the predicted response of stock prices.** Responses to unexpected policy easings bunched with those of the policy tightening. % with sp: share of models jointly meeting the sign constraints on the responses of inflation, unemployment, and stock prices. % without sp: share of models meeting the sign constraints on the responses of inflation and unemployment without considering the response of stock prices.

Group	Effect of Education	E(Group | Educ =0)	Variation (%)
Textbook	.028	.055	50.91
Cost Channel	.043	.117	36.75
Residual Model	-.039	.107	-36.45

Table 10: **Economic significance of education on interpretative model classification.** The table reports coefficients from regressions of group membership dummies (for each interpretative model) on education and controls. For each group, we report: (i) the estimated effect of high education from the regression; (ii) the baseline probability of group membership among respondents with low education; and (iii) the implied change in probability associated with high education, expressed relative to the baseline.

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

Table 11: **Placebo score: Correlation with education.** Correlation of placebo score with education. Education is a dummy variable that equals 1 when the individual has education equal to college or above college level, and 0 otherwise. Controls include gender, age, marital status, number of children, net monthly income, employment status, home-ownership, sentiment.

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

Table 12: **Phillips correlation, role of education in economics**. Regression of expected change in inflation on expected change in unemployment (*Prior - Perception*). Field Economics: major of the highest degree (irrespective of the degree level is in: economics, management, business administration, accounting. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo. Huber-White standard errors in parentheses. */**/*** refer to p-values lower than 0.10/0.05/0.01, respectively.

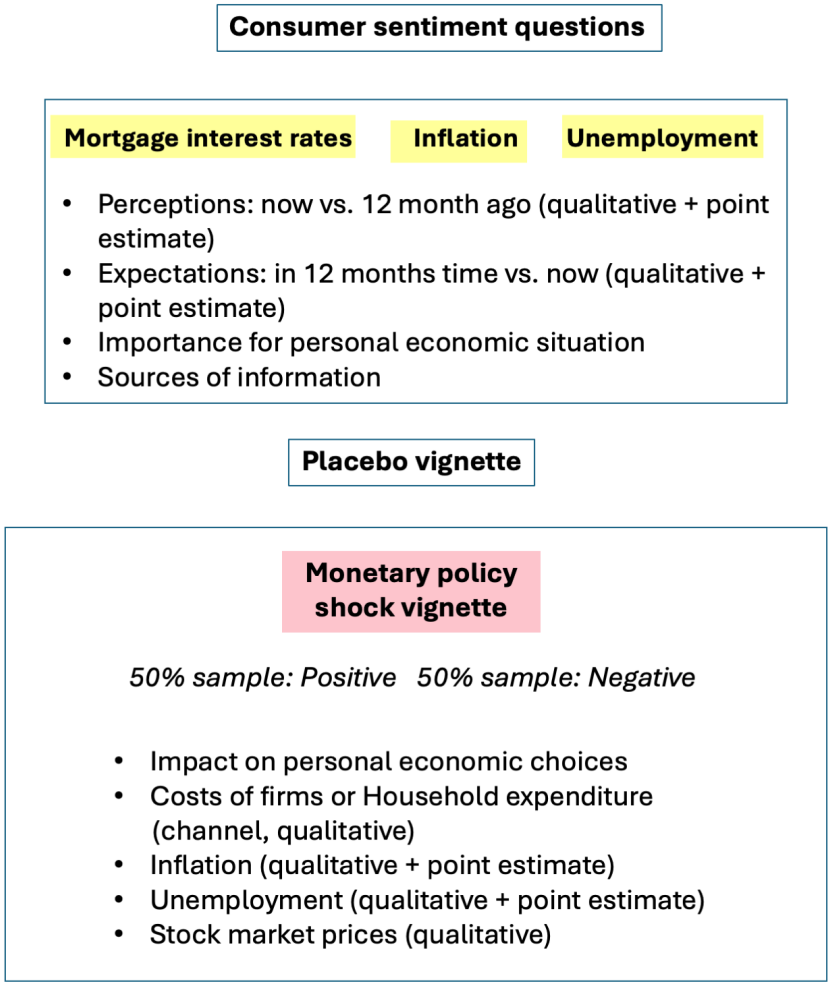

Figure 1: **Overview of the survey structure.** Sequence of blocks in the survey. "Placebo" refers to the discovery of a copper mine in Australia. The monetary policy shock vignette simulates an unexpected change in the policy rate by the European Central Bank of 50 basis points in absolute value.

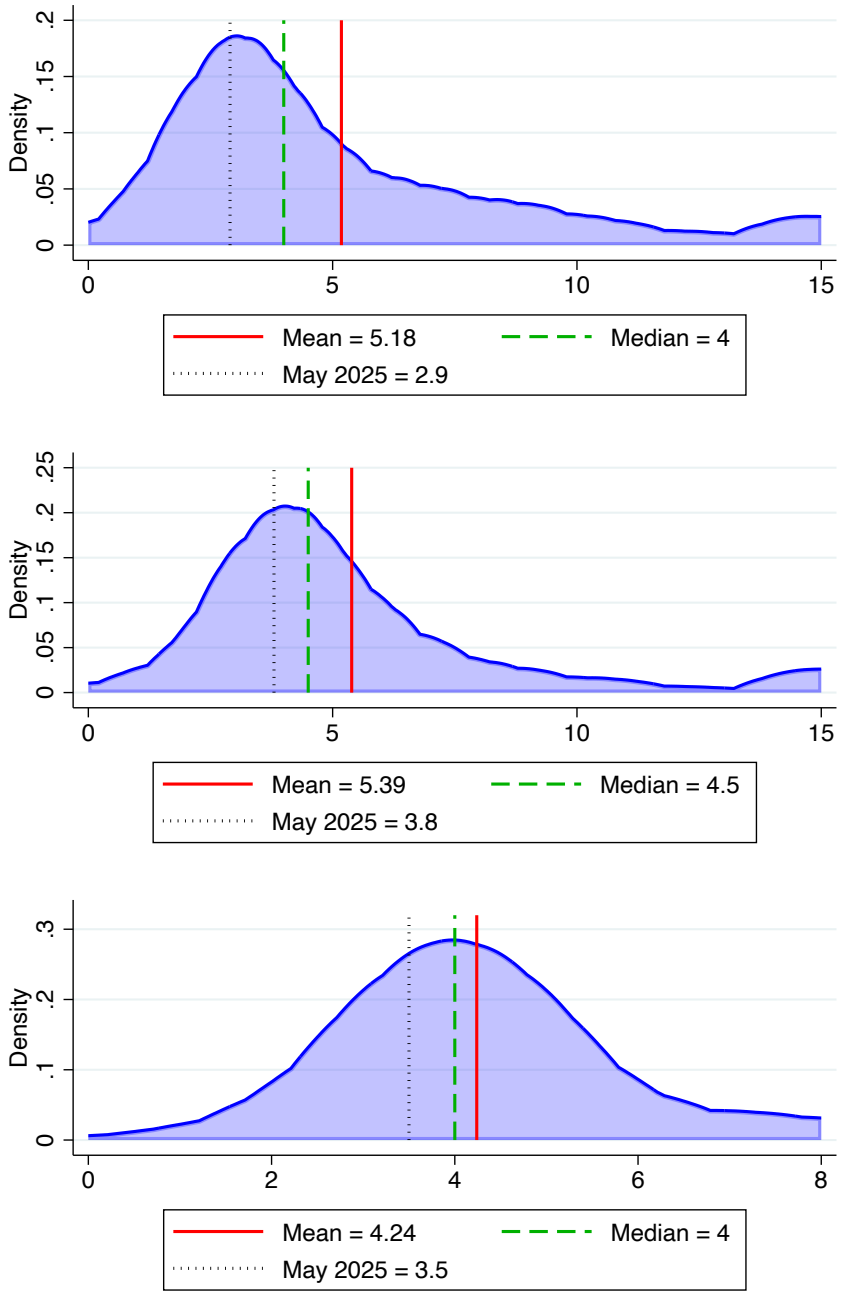

Figure 2: **Prior densities of inflation, unemployment, and mortgage rates one-year ahead.** Top panel: Prior density of year-on-year inflation. Central panel: Prior density of the unemployment rate. Bottom panel: Prior density of the mortgage rate (new loans). Mean and median figures refer to location measures conditional on households' forecasts. DNB forecasts: Predictions by the Dutch National Bank. Red dashed/green dash-dotted/black solid lines indicate the mean, median, and DNB's forecasts (where available). Densities plotted by employing an Epanechnikov Kernel, bandwidths: 0.8.

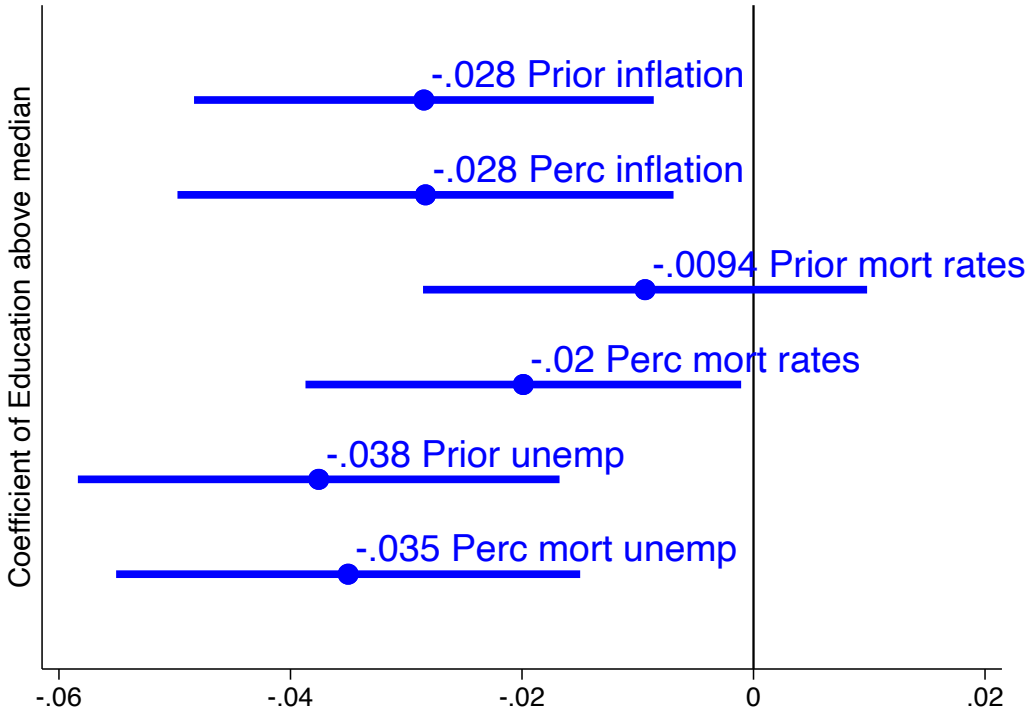

Figure 3: **Education and Tail Responses in Unconditional Beliefs.** Coefficients from regressions where the dependent variable is a dummy equal to 1 if the respondent's expectation or perception lies above the 95th percentile of the distribution. The main regressor is a high education dummy. Controls include age, gender, marital status, number of children, net income, employment status, homeownership, economic sentiment, and the placebo vignette score. Confidence bands: Huber-White standard errors.

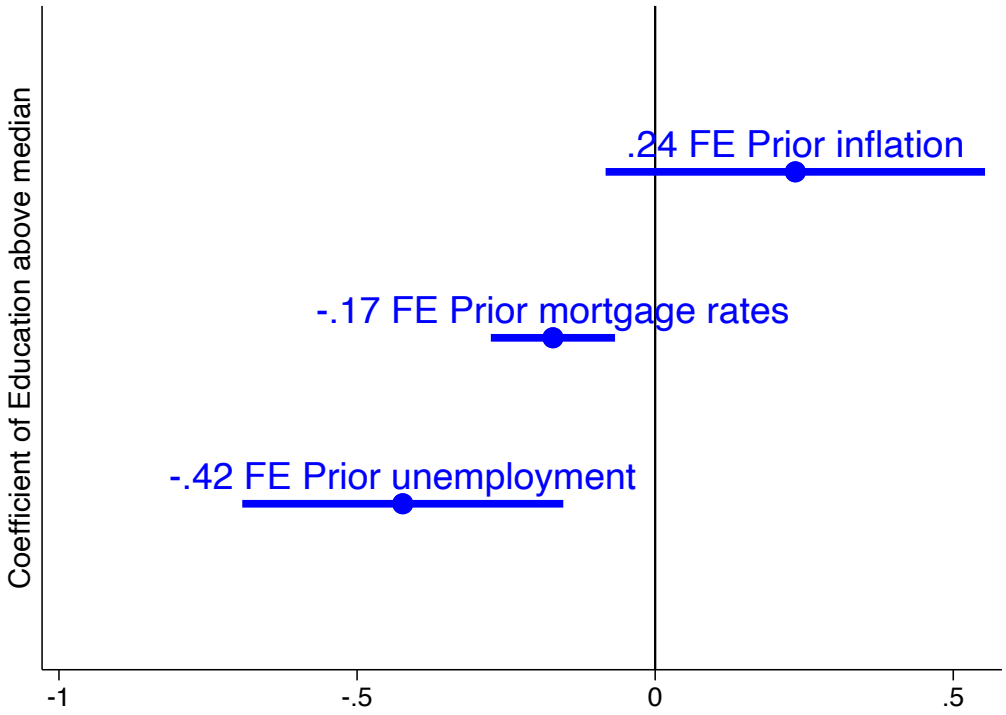

Figure 4: **Education and Forecast Accuracy.** Coefficients from regressions where the dependent variable is the forecast error—defined as the absolute value of the difference between respondents' expectations and the observed value of each variable in the Netherlands in May 2025 (inflation: 2.9%, unemployment: 3.8%, mortgage rates: 3.5%). The main regressor is a high education dummy. Controls include age, gender, marital status, number of children, net income, employment status, homeownership, economic sentiment, and the placebo vignette score.Confidence bands: Huber-White standard errors.

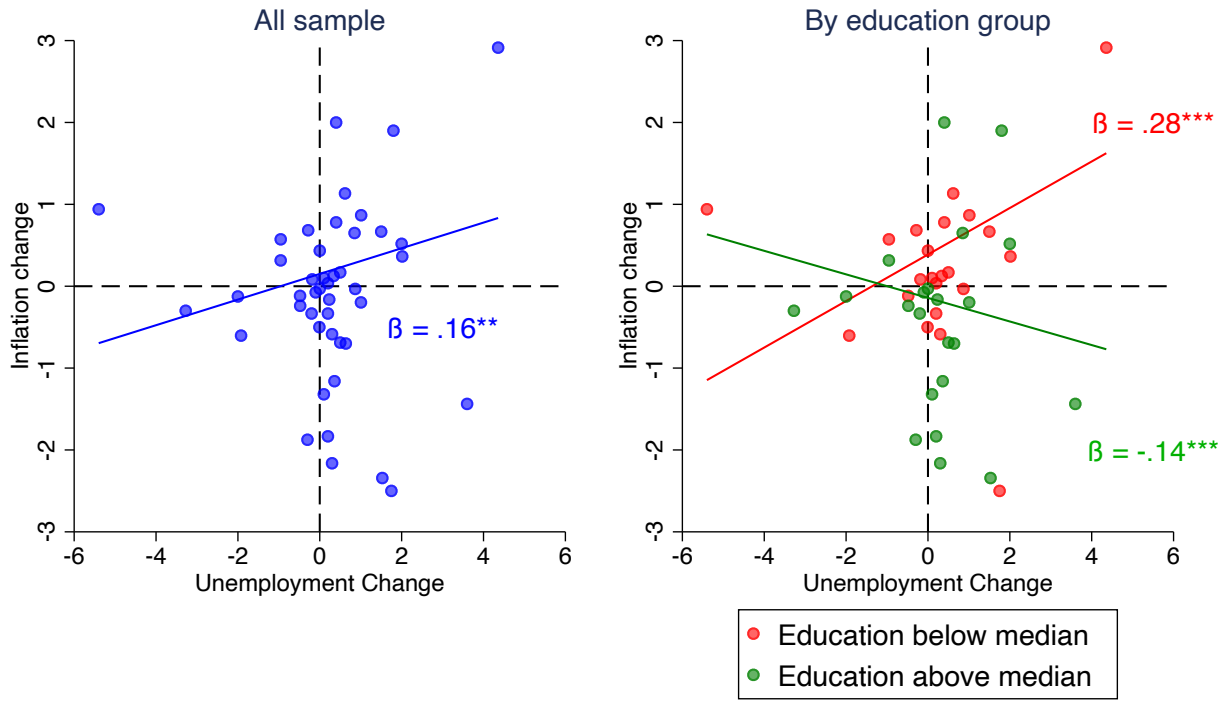

Figure 5: **Phillips correlation: Role of education, binned scatter plots.** Correlation between expected changes in unemployment and inflation. Regression coefficients of expected inflation changes over expected unemployment changes. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo. Huber-White standard errors.

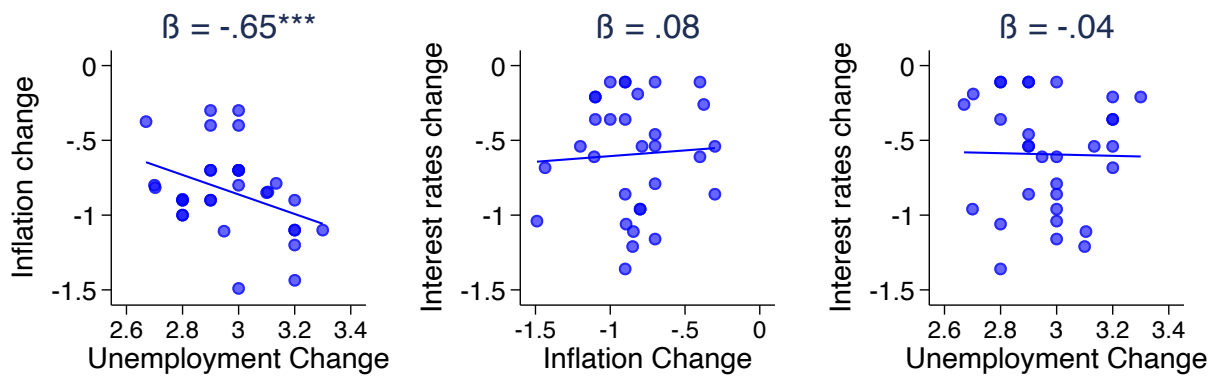

Figure 6: **Phillips correlation: Professional Forecasters.** Data from the ECB Survey of Professional Forecasters, 2024Q2 wave. We use expectations for inflation, unemployment, and mortgage rates in 2025Q2. Expected changes are computed by subtracting current values (2024Q2) in the Netherlands, under the assumption that professional forecasters observe current conditions. Slope coefficients are estimated using OLS.

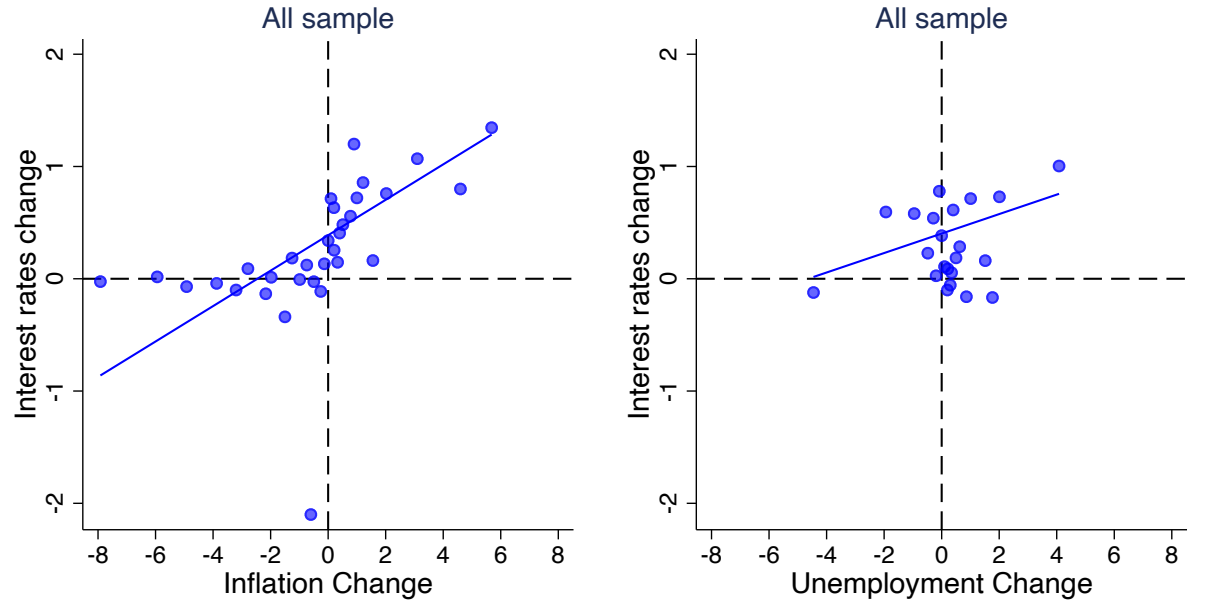

Figure 7: **Mortgage rates-macroeconomic indicators correlations, binned scatter plots.** Correlation between expected changes in the mortgage rate and inflation (left) and expected changes in the mortgage rate and unemployment (right). Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo. Huber-White standard errors.

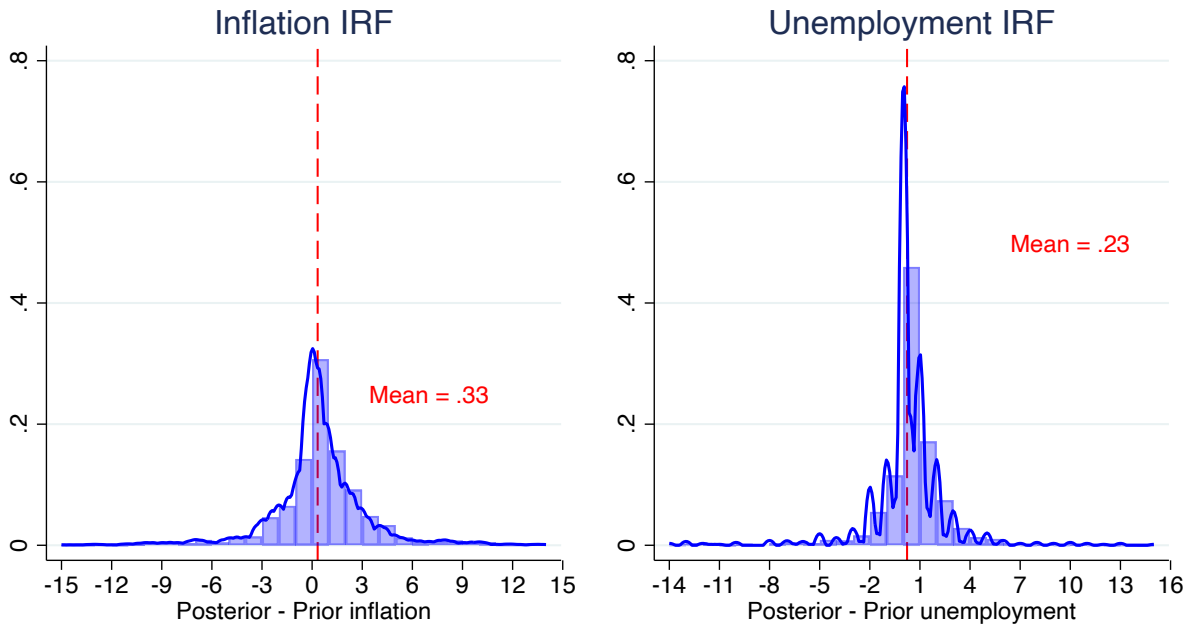

Figure 8: **Distribution of one-year ahead impulse response functions to an unexpected monetary policy tightening.** Size of the shock in our vignette: 50 basis points. Responses to unexpected policy easings bunched with those of the policy tightening, statistical evidence in favor of symmetry detected in the data. Densities plotted by employing an Epanechnikov Kernel, bandwidths: 0.2494 (inflation), 0.1660 (unemployment).

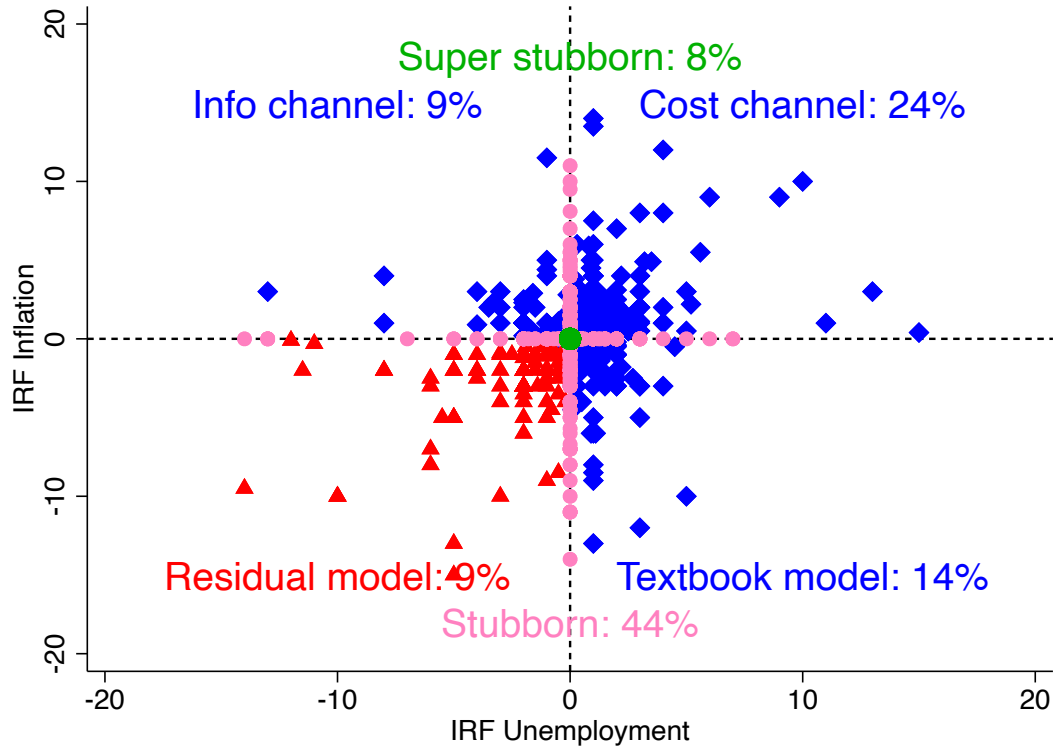

Figure 9: **Households' mental models: Classification conditional on the sign of the impulse responses of inflation and unemployment to an unexpected monetary policy tightening.** Responses to unexpected policy easings bunched with those of the policy tightening. The variables on the x- and y-axes are the numerical IRFs.

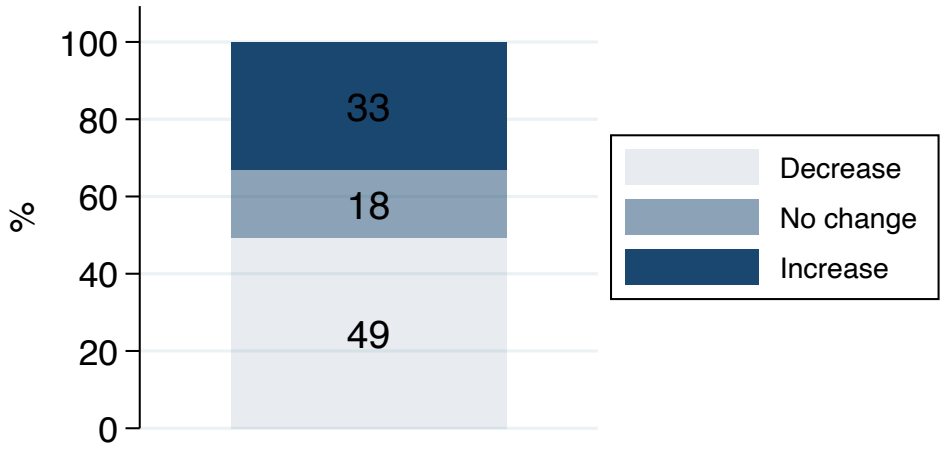

Figure 10: **Households' predictions on the response of stock prices to an unexpected monetary policy shock.** Responses to unexpected policy easings bunched with those of the policy tightening.

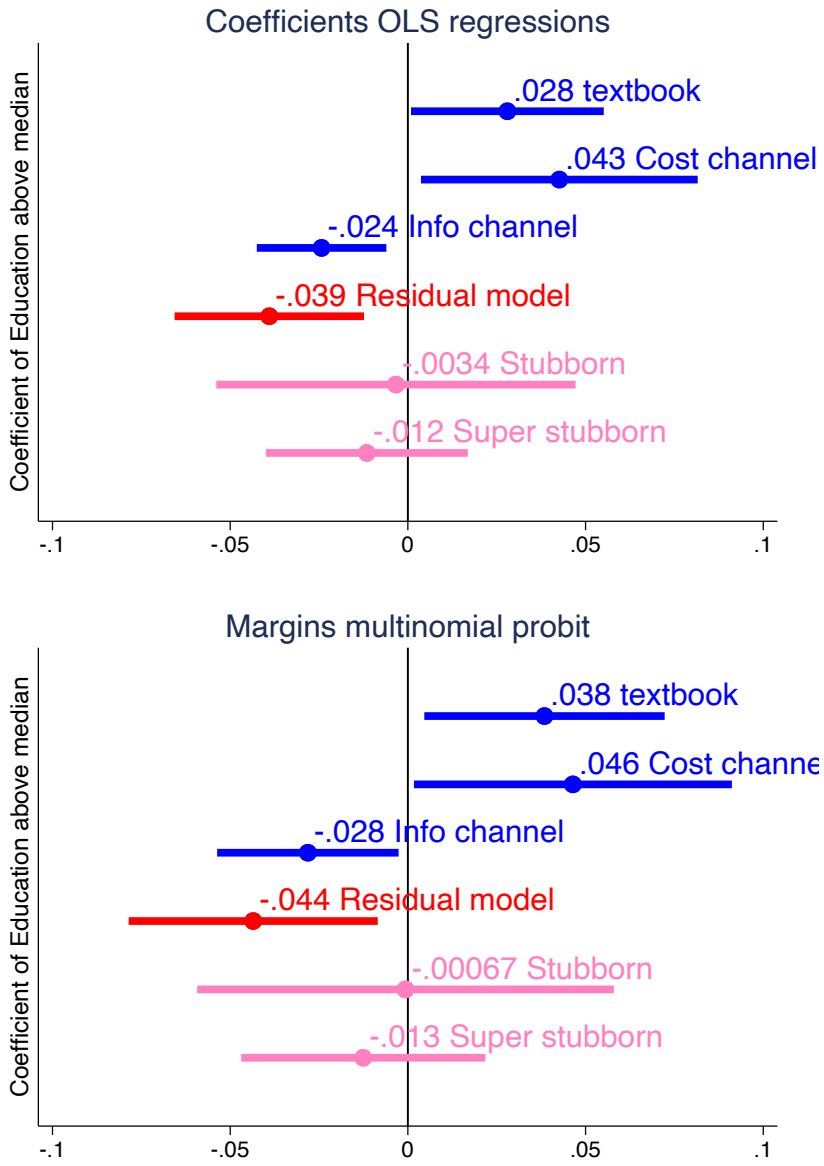

Figure 11: **Effect of high education on the probability of being associated with a given mental model.** Top panel: OLS regression conducted with the dependent variable defined as a dummy that equals 1 if an individual is associated with a specific mental model, as defined in Figure 9 and based on the sign restrictions on stock prices for group classification reported in Table 9, and 0 otherwise, considering each model at a time. Bottom panel: Multinomial probit regression conducted with the dependent variable defined as a categorical variable that takes values 1 when associated to Stubborn, 2 when associated to Super Stubborn, 3 when associated to Textbook, 4 when associated to Cost channel, 5 when associated to Info Channel, 6 when associated to Residual model. Mental models are defined in Figure 9, and based on the sign restrictions on stock prices for group classification reported in Table 9. Controls: age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo, randominazion group, expected change in mortgage rates (priors - perceptions). Huber-White standard errors.

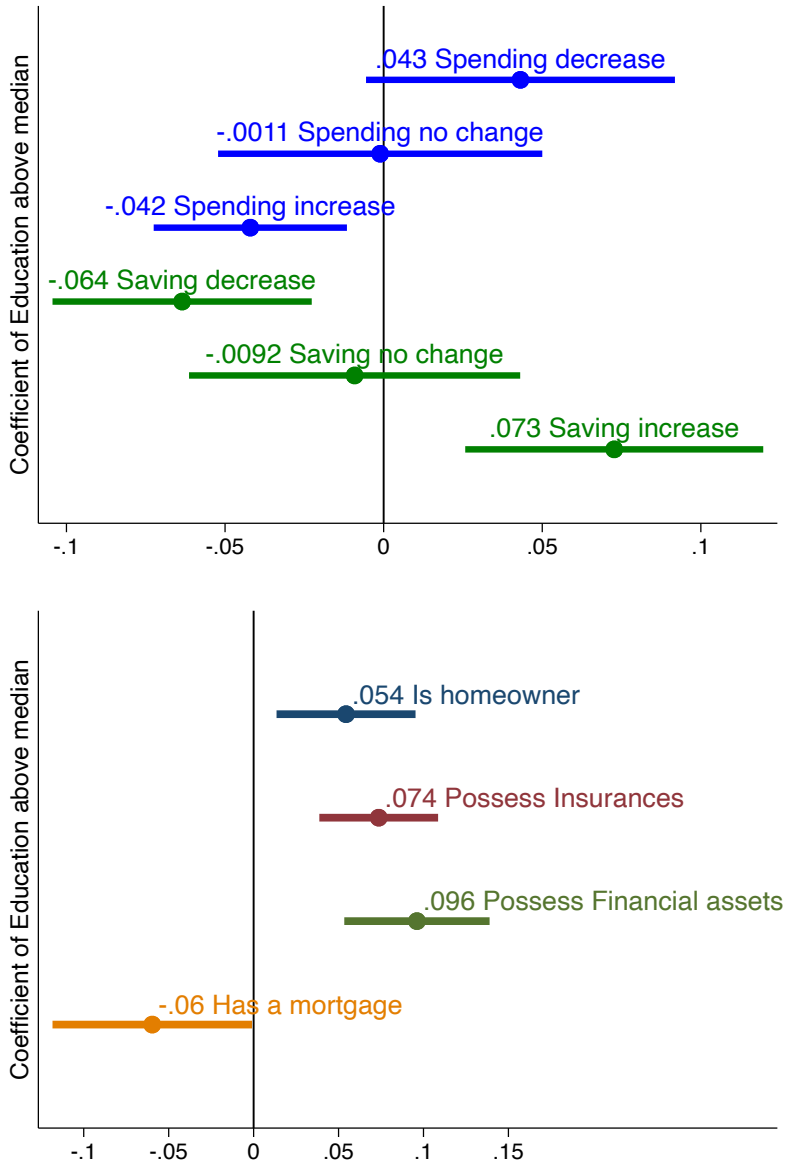

Figure 12: **Effect of high education on the probability of being associated with a given action and of owning assets.** Top panel: OLS regression conducted with the dependent variable defined as a dummy that equals 1 if an individual chooses a given action and 0 otherwise, considering each action at a time. The graph reports the coefficient of the variable "Education above median" in each of these regressions. Bottom panel: OLS regression conducted with the dependent variable defined as a dummy that equals 1 if an individual is in a given financial condition and 0 otherwise, considering each financial condition at a time. The graph reports the coefficient of the variable "Education above median" in each of these regressions. In all regressions, controls include age, gender, marital status, number of children, net income, employment status, homeownership, sentiment, placebo, randomization group, expected change in mortgage rates (priors - perceptions). Huber-White standard errors.

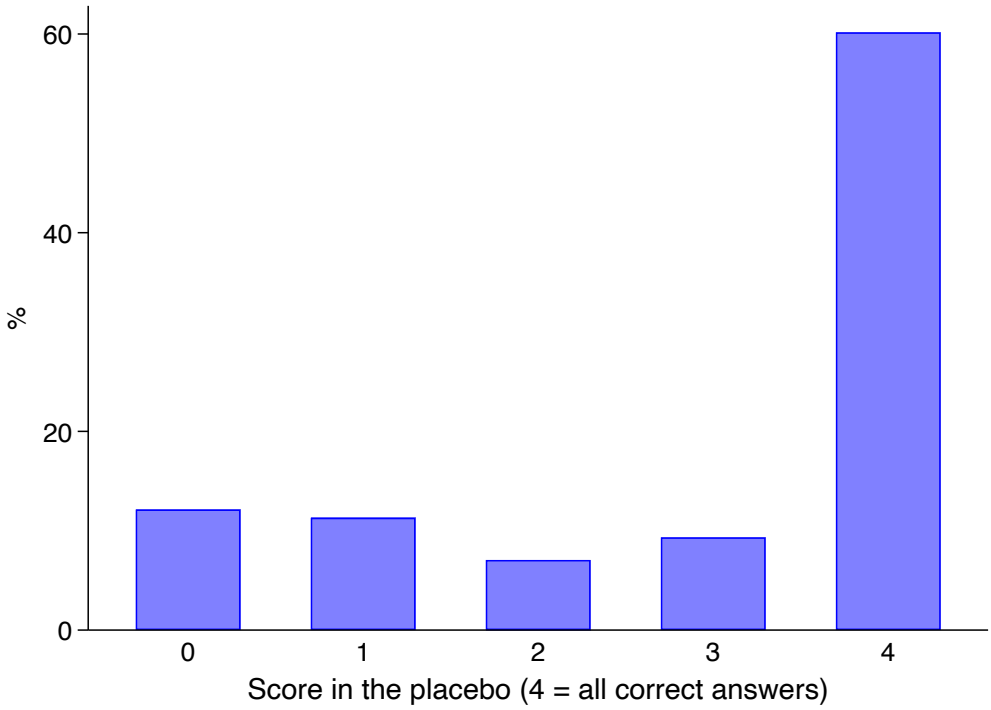

Figure 13: **Placebo score.** Score ranging from zero to four. Scenario: Discovery of a copper mine in Australia. Questions about variations in the cost of companies, households' expenditures, prices of goods, unemployment in the Netherlands. One point attributed to "no change" (all questions), "reduction in cost of companies", "reduction in prices of goods".

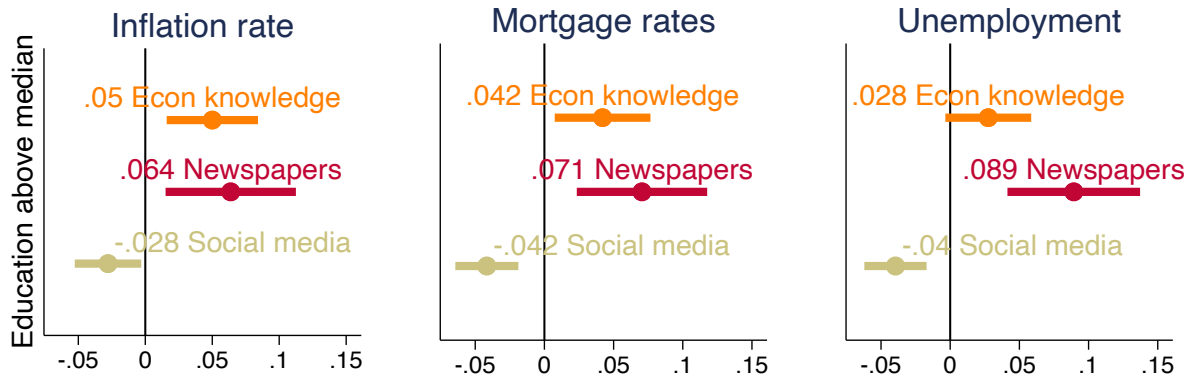

Figure 14: **Effect of high education on the probability of drawing information from a given source.** OLS regression conducted with the dependent variable defined as a dummy that equals 1 if an individual obtains information from a specific source and 0 otherwise, considering each information source at a time. Controlling for: gender, age, marital status, number of children, net monthly income, employment status, homeownership, sentiment, placebo score.

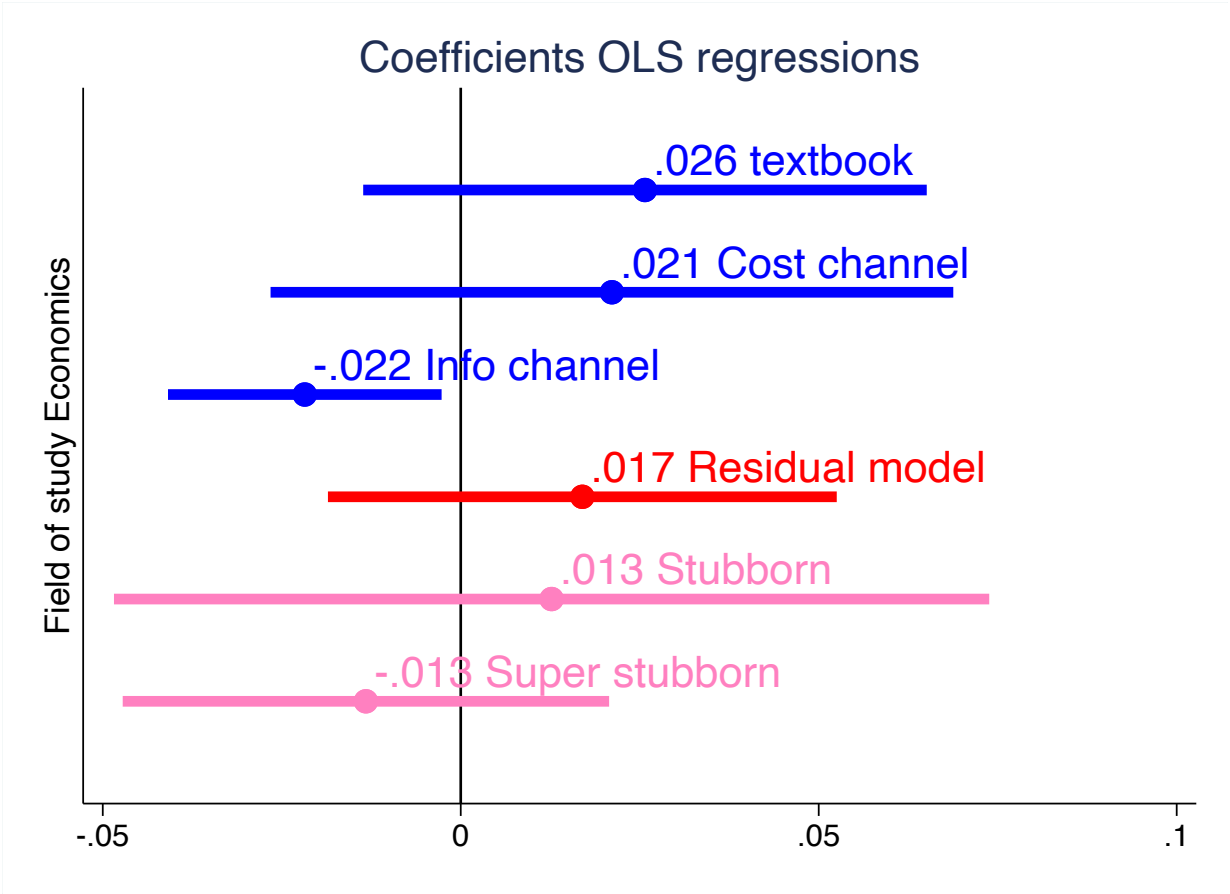

Figure 15: **Effect of Economics Education on the Probability of Belonging to a Given Mental Model.** Estimated coefficients of the variable *Field Economics* from OLS regressions where the dependent variable is a dummy equal to 1 if a respondent belongs to a specific mental model group, as defined in Figure 9 and classified according to the sign restrictions on stock prices shown in Table 9. The variable *Field Economics* equals 1 if the respondent's highest degree (irrespective of level) is in economics, management, business administration, or accounting. All regressions control for gender, age, marital status, number of children, net monthly income, employment status, homeownership, sentiment, and the placebo vignette score, randomization group, expected change in mortgage rates (priors - perceptions). Huber-White standard errors.