News Shocks, Consumer Confidence, and Business Cycles*

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Abstract

We study the causal effects of consumer sentiment shocks on macroeconomic aggregates. By constructing a novel instrument based on major non-economic news shocks in the United States over 1969 to 2022, and opinion polls around these events, we identify exogenous changes in consumer confidence. Our instrument explains significant variation in consumer confidence. Furthermore, using a proxy-VAR estimator and impulse responses, we document that a positive identified sentiment shock has strong and persistent expansionary effects on output, employment, and consumption spending. The dynamic causal effects of sentimental shocks highlighted in this study are robust to various sensitivity analyses and alternate estimations.

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Key Words: Consumer confidence; Instrumental variables; Dynamic causal effects; Sentiment

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A large body of macroeconomic research centres on understanding the effects of shifts in subjective expectations and belief formation on economic outcomes. Expectations about future economic environment can be a critical driver of business cycle movements. Changes in consumer confidence or sentiment may reflect revisions in beliefs about future economic conditions, thereby influencing spending decisions. For instance, a decline in consumption due to sentimental shifts is considered to be a key contributor to the US recession in 1990-91 (Hall, 1993; Blanchard, 1993).

Nonetheless, identifying the causal effect of consumer sentiment and expectations on consumption is challenging as many economists remain skeptical about the information contained in consumer confidence indices. The observed association between sentiment and consumer spending could reflect a common factor that may independently affect both sentiment and consumption (Gillitzer and Prasad, 2018). While the recent decline in confidence, as US consumers' views about their financial future slumped to lowest levels in over a decade, may be driven by rising concerns over proposed tariffs and inflationary expectations, the anticipated impact on macroeconomic aggregates and labour markets may be indicative of a combination of shifts in sentiment as well as economic fundamentals. Due to the difficulty in identifying innovations in consumer sentiment that are orthogonal to the variation in economic fundamentals, there is little empirical research investigating macroeconomic consequences of autonomous shocks to consumer confidence. Consumer expectations may also be correlated with time-invariant heterogeneous characteristics and preferences of individuals, which makes it difficult to isolate exogenous innovations in confidence (Makridis, 2022).

In this paper, we attempt to identify exogenous changes in sentiment to examine the dynamic causal effects of consumer confidence shocks on macroeconomic aggregates. By constructing a novel instrument based on major news events in the United States over 1969 to 2022, and survey responses and opinion polls administered close to the time of these events, we isolate sentimental shifts that are plausibly orthogonal to changes in economic

fundamentals. Our identification strategy focuses on major *non-economic* news and compares positive versus negative responses, measured by opinion polls, towards the news to construct the instrument. We argue that the identified sentiment shock does not represent a response to news about future improvements in productivity or potential policy changes, but instead captures waves of optimistic (or pessimistic) beliefs that are orthogonal to economic fundamentals and the state of the economy. Our instrument, thus, satisfies the exclusion restriction of affecting macroeconomic aggregates only through sentiment, and not through economic fundamentals. In this way, we generalise the approach adopted by Lagerborg et al. (2023) who estimate the causal effects of consumer sentiment shocks using fatalities in mass shootings in the United States as an instrument. Our paper builds on this insight but broadens the scope of news examined; we consider a wider set of social, legal, and political events that plausibly affect public sentiment independently of contemporaneous economic conditions.

Our empirical methodology uses the University of Michigan's consumer confidence survey data. It contains information about the views of a cross-section of the US population regarding the current state and future outlook of their personal financial conditions as well as the state of the US economy.[1] While a number of studies have used this survey to document the association between consumer confidence and macroeconomic conditions, the information content of answers to survey questions pertaining to consumer sentiment appears to be rather constrained in capturing actual beliefs. Furthermore, due to the complexity of the human mind, it is difficult to explain sentiments solely based on economic and financial decisions of households (Katona, 1951, 1975). Therefore, we construct a novel instrumental variable (IV) to extract exogenously driven shocks to consumer sentiment.

In order to construct the IV, we use public opinion polls and surveys conducted around key non-economic news events in the United States from January 1969 to December 2022. We focus on national news that satisfy a key selection criterion. Since news shocks about

the current or expected state of the economy are likely to have changed both the behaviour of economic agents as well as the conduct of economic policy, all news items potentially relevant to the state of the economy or expected economic policy changes are excluded. For example, the collapse of Lehman Brothers in September 2008 may be perceived as a sign of a looming financial crisis and an economic downturn, and therefore, is not categorized as non-economic news. On the other hand, lowering the legal voting age from 21 to 18 (June 1971) is considered to be an important national news event that is not expected to have a direct economic impact. Similarly, the explosion of space shuttle Columbia over Texas on February 1, 2003, had a conceivable impact on consumer confidence, as indicated by polling results, and is classified as a key non-economic news shock largely uncorrelated with economic fundamentals.

To elicit sentimental shifts after these events, we use public polls administered close to the time of each news item to compute a relative sentiment score associated with each news shock. We use polling data containing information on both positive and negative reported sentiments. The relative score is defined as the difference between positive and negative responses. For example, after the Columbia shuttle disaster, a special CNN/USA Today/Gallup poll was conducted that asked the following question: *When the space shuttle Columbia was lost yesterday, did you personally feel deeply upset, somewhat upset, not very upset, or not upset at all?'* Polling data revealed that 94% of Americans were either 'deeply upset' or 'somewhat upset' by the shuttle disaster, representing a strongly negative response. Based on this information, the relative score for this news item is calculated as: (6 - 94)/100 = -0.88. Thus, positive (negative) values of the relative score indicate an overall positive (negative) shock to consumer confidence, and the magnitude of the score represents the strength of the sentiment.[2]

In the subsequent analysis, we use the estimation strategy proposed by Stock and Watson (2018) and Mertens and Ravn (2013) to estimate the effects of identified sentiment shocks.

The proxy-VAR method uses external instruments for the structural shocks of interest in a VAR setting (Lagerborg et al., 2023), and enables us to study how autonomous shifts in consumer sentiment affect macroeconomic aggregates under key identifying assumptions. We document that the proposed instrument is correlated with consumer confidence, but is unrelated to other structural shocks. We address potential sources of measurement error and general survey and polling data issues by conducting numerous robustness tests, such as, employing alternative versions of our instrument and estimation methodologies.

We show that a positive shock to consumer confidence has an expansionary effect on the US economy reflected in increasing aggregate economic activity. Both consumption spending and output stay above their pre-shock levels for the duration of the forecast horizon and the response remains significant after several quarters of the initial shock. Consistent with the findings reported in Lagerborg et al. (2023), the positive impact is also visible in the labour market; there is a persistently negative impact on unemployment rate as a result of a positive identified sentiment shock. Barsky and Sims (2012) also find large and long-lasting effects of consumer sentiment on consumption in time-series data. However, in our case, the positive response of macroeconomic aggregates to a rise in consumer sentiment lasts longer compared to that identified in most existing studies. We augment the analysis by including additional variables of interest to examine their response to shifts in consumer sentiment, such as, interest rate, utilization adjusted total factor productivity, and consumer price index, and shed light on several novel findings. The impulse responses indicate, for instance, that the expansionary effects on various types of consumer spending show a similar pattern, but these effects are more pronounced for expenditure on services and recreational spending.

Our paper makes several contributions to this literature. First, we make a methodological contribution to the strand of literature that links consumer confidence to macroeconomic fluctuations by introducing a novel instrument. A number of recent studies identify shocks that are interpreted as sentiment. Our identification approach differs from a majority of the

existing literature focusing on mostly time-series data and the use of macroeconomic indicators as control variables in empirical work, such as, income growth and interest rates (Carroll et al., 1994; Ludvigson, 2004). Although many existing studies suggest that sentiment contains statistically significant independent information about future consumption growth, it remains unclear whether there is an independent causal effect of sentiment innovations on spending. In other words, the incremental predictive power of sentiment could simply reflect information contained in other variables excluded from the estimation models (Gillitzer and Prasad, 2018). Our instrument depicts exogenous variation that stems from exposure to social, political, environmental, religious, and other types of news shocks plausibly unrelated to economic fundamentals. This approach helps extract a shock that by construction has no direct or predetermined impact on the key macro aggregates. Due to the extensive use of controls and the unpredictability of identified sentiment shocks, our results document that changes in pure sentiment can substantially influence consumption decisions.

Second, compared to existing studies using instrumental variables to identify exogenous changes in consumer sentiment, such as, mass shooting incidents or elections results, we use relatively high-frequency movements in sentiment due to the nature of non-economic shocks examined in this study. A number of studies utilize unexpected political outcomes and election results as a source of variation in consumer sentiment to illustrate a significant effect of economic sentiment on consumer spending (Gillitzer and Prasad, 2018; Benhabib and Spiegel, 2019). Gerber and Huber (2010) demonstrate adjustments in individual consumption decisions depending on whether the preferred political party wins an election. Mian et al. (2015) use an event study around the election to isolate the probable effect of expectations on automobile purchases. Our paper builds upon these contributions by highlighting a new instrument and the role of seemingly unrelated news shocks on sentiment, and subsequently, on economic variables. These key local and national events are associated with a range of responses to opinion polls in terms of the predictability of responses as well as

the mix of positive and negative signals received. We emphasize on the role these shocks of varying nature play in propagating business cycle movements.

Third, we add to the body of literature suggesting that expectations solicited through surveys are informative of actions (Kamdar et al., 2018). Survey-based confidence indices contain information about future aggregate consumer expenditure (Carroll et al., 1994; Bram and Ludvigson, 1998; Ludvigson, 2004). Self-reported expectations have also shown to influence household's savings and spending decisions (Arnold et al., 2014; D'Acunto et al., 2016; Francesco et al., 2021; Coibion et al., 2023; Vellekoop and Wiederholt, 2019). We offer support for the use of consumer confidence surveys and spending plans elicited through these surveys, in line with previously illustrated generalizability of opinions produced in survey settings. We attempt to explicitly incorporate the role of non-economic news shocks in influencing consumer sentiment about the state of the economy. This seems only natural because, in addition to their personal experiences and financial circumstances, consumer sentiments are highly likely to be influenced by what they hear from the media about local and national developments. The precise timing of the shifts in sentiment at the time of these events implies that the variation reflects innovations in consumers' beliefs rather than their perceptions of current economic conditions potentially affecting the results of opinion polls.

Lastly, we offer useful insights for the theoretical literature on beliefs formation. There are competing views and conceptual frameworks on the role of sentiment in business cycle fluctuations. Macroeconomic fluctuations may be caused by purely psychological waves of optimism and pessimism (Keynes, 1936; Akerlof and Shiller, 2010; Nguyen and Claus, 2013). According to the advocates of this framework, any expansion driven by expectational errors must eventually lead to a bust as fundamentals remain unaffected. While the theoretical literature has focused mainly on the behaviour of the private sector (Beaudry and Portier, 2014), a number of empirical studies document that episodes of elevated sentiment can lower future growth, and countries with overly optimistic past growth expectations are

more likely to face economic crises (Al-Amine and Willems, 2023; Beaudry and Willems, 2022; López-Salido et al., 2017).[3] A possible channel of subsequent economic difficulties is unwarranted borrowing induced by over-optimism, giving rise to debt overhang. As hypothesized in Al-Amine and Willems (2023), the contracted funds can flow to finance government consumption rather than productive investment, with forecasts affecting government policies and private sector decisions that make the economy more recession prone (Beaudry and Willems, 2022).[4] Changes in expectations that are not necessarily driven by rational probabilistic calculations, famously labeled as Keynes' idea of animal spirits, have been emphasized as a major determinant of economic fluctuations.[5] Nonetheless, expectations are typically modelled as formed based on rational expectations hypothesis and there is limited scope for variations in expectations in the spirit of those emphasized by Keynes, i.e., driven by sentiment, market psychology, or expectational shifts unrelated to primitive structural disturbances. Our empirical results present a necessary condition backing theoretical macroeconomic models underlining sentiment or beliefs as a non-fundamental driver of economic activity (Benhabib et al., 2015, 2016). We show that the identified sentiment is indeed correlated with confidence shocks obtained from available survey data on consumer sentiments. Moreover, we highlight that there can be a significant dispersion in these beliefs in response to various non-economic news shocks indicated by low relative scores obtained from opinion polls.

The remainder of the paper is organized as follows. Section I provides a description of the data and methodological approach used. In Section II, we present a discussion of the effects of sentiment shocks on consumption spending and other macroeconomic indicators. We provide robust evidence indicating that consumer sentiment has a causal effect on the macroeconomy. A number of extensions to the baseline results and robustness checks are explained in Section III. The final section concludes.

I DATA AND METHODOLOGY

Our identification approach draws on subjective expectations as measured by the University of Michigan's consumer confidence survey data. As explained below, this time series data contains information about the views of a cross-section of the US population regarding the current state and future outlook of their personal financial conditions as well as the state of the US economy. Although a number of existing studies have consistently shown that consumer sentiments elicited through consumer confidence surveys have a strong predictive power in explaining consumption and income growth (Ludvigson, 2004), the evidence reported in a majority of these cases does not adequately disentangle the effects of autonomous shocks to consumer confidence from variations in consumer confidence reflecting a response to changes in economic fundamentals. We, therefore, adopt an instrumental variable framework to isolate the effects of exogenously driven shocks to consumer sentiment. Lagerborg et al. (2023) illustrate this point using a state-space representation of a dynamic stochastic macroeconomic model, and assuming that survey evidence on consumer confidence can be considered as an empirical measure of one of the components of endogenous controls, the autonomous component may be extracted with the help of an instrument. The IV must be correlated with the empirical measure of consumer confidence index but unrelated to the fundamentals, and thus, can be used to recover the autonomous innovation to the survey measure of consumer expectations.

In this section, we explain the data and empirical methodology adopted in this study. We first briefly describe the Index of Consumer Sentiment (ICS) obtained from the University of Michigan's consumer confidence survey. Next, we discuss the construction of our IV and provide details about non-economic news shocks considered in our analysis. Finally, we review the proxy-VAR estimation methodology and investigate the validity of our instrument.

I.I Consumer sentiment survey

The measures of consumer sentiment used in existing studies are often based on survey questions that relate to the present and expected financial situation of households, present and expected general economic situation, and future spending plans (Vuchelen, 2004). We use the University of Michigan's Index of Consumer Sentiment (ICS) to measure consumer confidence. Since 1977, the index has been published every month by the Survey Research Center at the University of Michigan, but the survey has been conducted annually since the late 1940s. We use survey data from 1969 to 2022. A nationally representative sample of roughly 500 households is randomly selected and interviewed over phone each month.[6] The ICS is based on individual-level responses to the following five questions about the current and expected state of the respondents' own financial situation and that of the US economy:

1. Would you say that you (and your family living there) are better off or worse off financially than you were a year ago?

2. Now looking ahead - do you think that a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?

3. Now turning to business conditions in the country as a whole - do you think that during the next twelve months we'll have good times financially, or bad times, or what?

4. Looking ahead, which would you say is more likely - that in the country as a whole we'll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?

5. About the big things people buy for their homes - such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or bad time for people to buy major household items?

For each of the five questions above, survey respondents choose one of the three options, namely, "good/better", "same", or "bad/worse". Based on these responses, an index is constructed for each of the five questions as the percentage of respondents who responded positively minus the percentage who responded negatively, plus 100. Finally, an average of these five statistics, relative to 1966 set as the base year, is reported as the ICS index.

A number of studies have documented the association between consumer confidence measures based on the University of Michigan's Survey of Consumers and macroeconomic conditions. Lahiri and Zhao (2016) indicate the cyclical behavior of ICS and its components, and note that the index consistently leads the business cycle with an average lead of about three quarters. Lagerborg et al. (2023) use responses to the forward-looking questions aggregated in the Index of Consumer Expectations (ICE), and show that ICE is correlated with industrial production and unemployment, and usually tends to peak at the later stages of economic expansions. The estimation results discussed later in this paper also suggest that expectations solicited through surveys are informative of actions and household spending plans. We attempt to identify an exogenously determined component of this consumer confidence time series data with the help of an IV. The next section describes the construction of our instrument.

I.II Relative scores of non-economic news shocks

While a number of studies have incorporated consumer sentiment in a consumption function (Katona, 1975; Côté and Johnson, 1998; Eppright et al., 1998), researchers remain critical of the explanatory power of consumer sentiment after controlling for economic fundamentals (Acemoglu and Scott, 1997; Carroll et al., 1994). Kamakura and Gessner (1986) suggest that the predictive power of sentiments is limited to a few consumer goods, such as, purchase of new cars and single-family homes. Thus, the information content of answers to survey questions pertaining to consumer sentiment appears to be rather constrained and limited in

capturing consumer beliefs.

In this section, we describe the formulation of a novel instrumental variable to extract exogenously driven shocks to consumer sentiment in the United States. We compile a new dataset of major news events in the US over January 1969 to December 2022, and next, use public polls administered close to the time of each news item to compute a relative sentiment score associated with each news shock. We cross-check all important news events and include only news items that satisfy two broad selection criteria. First, we focus on national news only. According to Pew Research, most Americans pay more attention to national rather than international news. Second, since news shocks about the current or expected state of the economy are likely to have changed both the behaviour of agents as well as the conduct of economic policy, all news items potentially relevant to the state of the economy or expected economic policy shifts are excluded. For example, Lehman Brothers filed for bankruptcy on September 15, 2008, after a series of events that led to the firm's collapse. While this news shock may have a significant negative impact on consumer confidence, and subsequently, consumption spending and income, the collapse of Lehman Brothers may have been perceived as a sign of a looming financial crisis and economic downturn, thereby lowering levels of investment and GDP.

We use various sources on the internet to identify news items. For example, the year-by-year news and events published by Infoplease (`https://www.infoplease.com/yearbyyear`) provides a comprehensive list of news shocks. After manually conducting a rigorous web-based search of major events in the US, we include only non-economic news that fulfil the criteria mentioned above for the purpose of instrument construction, while discarding news items directly related to the state of the economy. An example of a news event that is included in our analysis is from June 1971 when the government reduced the legal voting age from 21 to 18. Another example is the explosion of space shuttle Columbia over Texas on February 1, 2003, that killed all seven astronauts. In both cases, although there was a

conceivable impact on consumer confidence, as indicated by polling results described below, the news were largely uncorrelated with economic fundamentals. Our sample of news shocks, therefore, encompasses a diverse set of political, social, legal, and international events that are unrelated to economic outcomes.

After verifying the news items that can be used, we obtain information on sentiment drawn from public polls administered around the time of these events. An important criterion of news selection and data compilation at this stage was the administration and availability of such a poll after the event. Through a systematic search of survey database and repositories available online, we focus on key events that were also the subject of a public poll conducted close to the time of the event. More specifically, the polls asked about the survey participant's feelings regarding the event. For example, after the Columbia shuttle disaster, a special CNN/USA Today/Gallup poll conducted on February 2, 2003, indicated that 94% of Americans were either 'deeply upset' or 'somewhat upset' by the shuttle disaster, representing a highly negative sentimental response. In particular, the survey asked the following question: "When the space shuttle Columbia was lost yesterday, did you personally feel deeply upset, somewhat upset, not very upset, or not upset at all?" The results are based on telephone interviews with 462 adults, aged 18 or more.

A majority of opinion polls employed in this study are based on Gallup surveys, however, there are some instances where polling results are published through various popular media and newspapers, such as, The New York Times and Washington Post. Gallup surveys follow a rigorous methodology to gather nationally representative data at a high frequency across different regions and over time, and consequently, offer an obvious advantage for the objective of this paper. An additional advantage is that they are widely used, carefully designed surveys, which allows for comparability of our sentiment measure along with the reliability of the underlying data.

Based on surveys and polling data containing information on both the positive and nega-

tive reported sentiments, we compute a *relative score* for each news item using the following:

$$\text{Relative score} = \frac{\text{Positive response} - \text{Negative response}}{100} \tag{1}$$

Therefore, the relative score for the news about space shuttle explosion is calculated as: (6 - 94)/100 = -0.88. About 4% of Americans seemed 'not very upset' or 'not upset at all', with 2% reporting no opinion on the subject. We lump the *no response, no opinion* responses in the category with the lower score ('not upset' in this case). As explained later, this may introduce potential measurement issues which we address in Section III by re-grouping *no opinion* responses to the majority opinion. As additional news selection benchmark, we exclude polls where a majority of respondents expressed *no opinion*. This means that most survey respondents took a definite stance - positive or negative - on the event, while a relatively small fraction reported neutral or no-opinion responses.

Similarly, an opinion poll following the announcement about voting age in June 1971 indicated that a majority of US nationals supported the decision (60%), yielding a relative score of (60 - 35)/100 = 0.25. Thus, the relative score ranges between +1 and -1, with positive values indicating an overall positive shock to consumer confidence, and the magnitude of the score representing the strength of the sentiment. On January 25, 2017, for instance, when a set of executive orders directing the US Department of Homeland Security to begin the construction of a wall on the US–Mexico border were signed, a small majority of Americans opposed the decision, suggesting an overall negative shock to consumer confidence, and a relative score of (36 - 56)/100 = -0.2.

Figure 1 depicts the historical realizations of relative scores of consumer sentiment from January 1969 through May 2022. A complete list of selected news shocks and the corresponding relative scores are provided in a Supplementary Appendix. The volatile and frequent nature of these news shocks is important because it relates to the channel through which

their impact is expected to spill over to sentiment. For example, the relative score at the time of a major ruling by the Supreme Court on racial diversity programs in higher education in June 1978 represents a largely negative sentiment with a relative score of -0.61.[7] There is a strong positive shock to sentiment in May 2003 after the US government declared an official end to combat operations in Iraq, and the setting up of a new civilian administration in the country led by the US. This period is associated with a relative score of 0.88 based on a Gallup survey.

Some additional notes about the process of data construction and interpretation of polls used are as follows. First, although it was rare, if multiple comparable polls were conducted addressing a specific news event, we chose the one administered closer to the time of the event and more directly linked with an assessment of broader sentiment. Second, while most polls directly ask respondents to evaluate events in favourable or unfavourable terms, some questions are phrased differently (for example, eliciting 'reactions' rather than explicit ratings). In such cases, we map the majority response to the corresponding sentiment polarity. For instance, following the Sandy Hook school shooting on December 14, 2012, 52% of respondents reported a negative reaction. We interpret this as a strong negative shock to sentiment, yielding a relative score of –0.52. This procedure ensures consistency in the construction of our instrument while also accounting for variation in question wording for certain events.

Third, we carefully reviewed survey questions and responses to ensure that the coding of positive and negative sentiment shock was consistent with the broader interpretation of events. More specifically, we do not always treat the raw affirmative response as positive sentiment in a mechanical way, but instead interpreted responses in an attempt to extract true sentimental shifts. For example, in October 1995, when the verdict of O.J. Simpson's acquittal was announced, a poll asked, "Do you personally believe the charges that O.J. Simpson murdered Nicole Brown Simpson and Ronald Goldman are definitely true, probably true,

probably not true, or definitely not true?" A clear majority of 56 percent responded "Definitely/Probably true." While this might appear as a strong positive response to the poll, it actually reflects a negative sentiment shock in terms of a majority public belief that diverged from the legal outcome. Thus, in some cases, sentiment classification required contextual interpretation, and our approach ensures that the relative score consistently captures the underlying direction of sentiment in relation to each event.

Lastly, for the estimation of proxy-VAR using quarterly data, when multiple qualifying events occur within the same quarter, we aggregate their relative scores by a simple summation. For example, in 1998Q4, the death of Matthew Shepard in October, 1998, together with the impeachment of President Clinton in December 1998, produce a combined score of –0.78. Since our interest lies in the cumulative effect of contemporaneous shocks to sentiment within a quarter, instead of averaging or weighting, this approach ensures that multiple shocks of the same sign reinforce each other, while shocks of opposite sign partially offset.

There is a potential concern about classification of certain non-economic news events that may eventually have major economic consequences. The terrorist attack in New York on September 11, 2001, is a non-economic event per se, that has been shown to have massive economic repercussions in the United States as well as in other countries, including an immediate impact on stock markets, business sentiment, and speculation about future economic activities. There are other instances of terrorism or a full-scale war beyond the national border, such as, the launch of war in Iraq by the US and Britain on March 19, 2003, or Iraq's invasion of Kuwait on August 2, 1990, that led to a massive military buildup by the United States. According to a Gallup poll, approximately 90% of Americans disapproved of Iraq after Iraqi missiles killed dozens in an attack on a US frigate in the Persian Gulf on May 17, 1987. The war was arguably the cause of soaring oil prices, causing economic recessions around the world. Although there is a small number of instances of international conflict or war in our news database, to mitigate possible concerns about endogeneity, we exclude

geopolitical events that could plausibly have economic consequences; non-economic news events that may have been associated with direct changes in government defence spending are excluded from the analysis. Specifically, we cross-checked our list against the defence news narrative developed by Ramey and Zubairy (2018) to identify events historically linked with significant revisions in expected military expenditure (Ramey, 2011). This step ensures that our methodology disregards events that may have influenced the economy through fiscal channels, thereby strengthening the validity of the exclusion restriction.

Thus, we attempt to use our IV to investigate the role of local and national factors in consumer expectation and belief formation, and quantify the causal effect of beliefs on spending patterns, particularly as a potential mechanism for driving business cycle fluctuations. This seems only natural because, in addition to their personal experiences and financial situations, consumer sentiments are likely to be affected by what they hear from the media about local and national developments. The precise timing of sentimental shifts at the time of the shock suggests that the variation reflects exogenous changes in consumers' beliefs rather than perceptions of the current economic conditions potentially affecting the results of opinion polls. In addition, relatively high-frequency non-economic news shocks employed in this study contain important national events with a range of responses to opinion polls in terms of the predictability of responses as well as the mix of positive and negative sentiments observed. In fact, there can be a significant dispersion in these beliefs indicated by low relative scores for a number of key events.

I.III Econometric methodology

To identify and estimate the causal effects of shocks to consumer sentiment, we adopt an estimation strategy proposed by Stock and Watson (2018) and Mertens and Ravn (2013). The proxy-VAR, or SVAR-IV, method uses external instruments for the structural shocks of interest in a VAR setting (Lagerborg et al., 2023).[8] This approach allows us to study how

autonomous shifts in consumer sentiment affect macroeconomic aggregates under two key identifying assumptions, namely, the proposed instrument affects consumer confidence, and is unrelated to other structural shocks, that is, the exogeneity assumption. In other words, we assume that the relative scores derived from surveys and polling data represent a series of exogenous changes in sentiment that are correlated with the structural confidence shocks of our interest, but uncorrelated with other structural shocks. Later in the paper, we show that the results obtained from proxy-VAR estimation methodology are robust to alternative estimation techniques, including an augmented-VAR (VARX) model.

Let X_t be an $n \times 1$ vector of endogenous observables perturbed by an $n \times 1$ vector of structural shocks, v_t, assumed to be mutually orthogonal. X_t can then be represented as:

$$X_t = A(L)X_{t-1} + e_t, \tag{2}$$

where e_t is the $n \times 1$ vector of innovations, and $A(L)$ is a lag polynomial. Eq. 2, therefore, represents the reduced form dynamics of endogenous observables. The vector of endogenous variables, X_t, includes natural logarithm of consumer confidence index (CC), natural logarithm of output (Y), natural logarithm of consumption spending (PCE), unemployment rate (u), interest rate (r), and consumer price index (CPI). That is, $X_t = [CC_t, Y_t, PCE_t, u_t, r_t, CPI_t]'$. By including a wide range of control variables, we are able to capture the dynamics induced by state variables (see Lagerborg et al. (2023)) and also control for other structural shocks. The estimation of Eq. 2 also includes a constant and linear time trend.

Say, the VAR innovations, e_t, are given by linear combinations of the structural shocks represented by v_t:

$$e_t = Fv_t.$$

The structural shocks are assumed to satisfy the following: $Ev_t = 0$, $E[v_t v_t'] = I$, $E[v_t v_s'] = 0$ for $s \neq t$ where I is the identity matrix. Consider the partition $v_t = [v_{1t}, v_{2t}']'$, where v_{1t} is the structural shock of interest and $(n-1) \times 1$ vector v_{2t} contains all other $n-1$ shocks. In this case, the goal is to estimate the first column of F, denoted as F_1, that corresponds to the latent sentiment shocks v_{1t}. Since $E[e_t e_t'] = FF'$, an estimate of the covariance matrix of e_t provides $n(n+1)/2$ independent identifying restrictions. In addition, the proxy-VAR estimation imposes the following identifying assumptions:

$$\begin{aligned} E[d_t v_{1t}] &= \phi \\ E[d_t v_{2t}'] &= 0, \end{aligned}$$

where d_t denotes the series of identified sentiment shocks correlated with the latent confidence shocks v_{1t}, but orthogonal to other structural shocks v_{2t}, and ϕ is an unknown scalar. These identifying assumptions translate to additional linear restrictions on the elements of F, which identifies F_1 (Stock and Watson, 2018). Following Mertens and Ravn (2013), to implement the proxy-VAR method and derive the parameters of interest, we proceed as follows.

As the first step, Eq. 2 is estimated using least squares method and reduced form errors $\hat{e}_t$ are calculated. For the partition $\hat{e}_t = [\hat{e}_{1t}, \hat{e}_{2t}']'$, $\hat{e}_{1t}$ is then the reduced form errors from the first equation with consumer confidence index, and $(n-1) \times 1$ vector $\hat{e}_{2t}$ contains all other reduced form errors. Next, we regress the residuals from the first equation ($\hat{e}_{1t}$) on our instrumental variables, i.e., relative scores associated with non-economic news shocks, and collect the fitted values. To capture the delayed effect of sentiment shifts on macroeconomic aggregates, the estimation includes 4 lags of the constructed sentiment shock series along with the contemporary values as instruments. Finally, the reduced form residuals from other variables in the VAR ($\hat{e}_{2t}$) are regressed on the fitted values of sentiments from the last step. The coefficients obtained are then used to generate the impulse response functions. The impulse responses presented and explained in Section II follow unit effect normalization, since

the scale of the latent sentiment shock is indeterminate. In other words, the impulse responses can be interpreted as the percentage change in economic aggregates in response to one percent increase in consumer confidence. Standard errors are calculated using recursive wild bootstrap method (Mertens and Ravn, 2013), and we indicate 68 and 90 percent confidence intervals.

The goal of this study is to investigate the impact of sentiment shocks on a range of macroeconomic indicators. The key macroeconomic variables that we examine in our baseline estimation include output, consumption spending, unemployment and interest rates, and consumer price index. We also consider components of consumer spending, such as, private sector consumption of non-durables and durables, recreational spending, and spending on services. In a subsequent analysis, we explore the impact of sentiment shock on utilization adjusted total factor productivity. One of the extensions of our model includes economic policy uncertainty index in the proxy-VAR estimation, as explained in Section III. Table 1 provides a list of the variables used and data sources. Real GDP, unemployment and interest rates, and CPI are obtained from the Federal Reserve Economic Data (FRED), published online by the Federal Reserve Bank of St. Louis. Data for consumption, consumption of durables and non-durables, recreational spending, and exports and imports are sourced from The Bureau of Economic Analysis. TFP data is based on Fernald and Wang (2016), and the Economic Policy Uncertainty index is obtained from Baker et al. (2016).

<Table 1 here>

I.IV Instrument strength

The use of non-economic news shocks as an instrument for shifts in consumer sentiment is based on the assumption that these news events are considered exogenous to economic fundamentals. Furthermore, the evidence on the link between news shocks and waves of consumer

optimism and economic choices offers a potential channel through which the instrument may have an impact on survey evidence related to consumer confidence about the US economy. To evaluate whether our instrument satisfies the relevance condition, we report the results of the first-stage F-statistics and p-values for the null hypothesis that the instrument has no explanatory power for consumer confidence. Table 2 shows weak instrument F-test statistics in the top two rows. For instance, the dependent variable in the top row is first-differenced consumer confidence index for the complete sample period, which is regressed on the relative score for news events based on opinion polls and survey data. In this case, the F-statistic is equal to 13.57. Since we use a single instrument, it is possible to apply the standard rule-of-thumb of a critical value of 10 to gauge the strength of the instrument (Montiel Olea et al., 2021a). The following row uses monthly values of the instrument as the independent variable (discussed in Section III). The F-statistic, while being lower than 10, is still significant and lends support to the relevance assumption of our instrument. This evidence supports the view that consumer sentiment is correlated with the information content of mass media, and opinion polls based on these news events.[9]

<Table 2 here>

In the second block of Table 2, we test whether the series of identified sentiment shocks, d_t, are orthogonal to other structural shocks, v_{2t}. It reports the weak instrument test for the instrument used, and in the following row, the relative score is replaced with an indicator variable which equals one if a news event is associated with a positive relative score, indicating an overall positive shock to confidence, and zero otherwise. Similarly, negative shocks are recorded as -1, without utilizing the actual relative score. We test whether shocks to economic fundamentals Granger cause identified sentiment shocks, using first-differenced values of economic aggregates, including income, consumption spending, consumer prices, unemployment, and interest rates. To check whether our instrument satisfies the exclusion restriction, we test the null hypothesis that the economic variables have no explanatory

power for the instrument, against the alternative where economic fundamentals Granger cause non-economic news shocks. The chi-squared test statistics and p-values reported in the last two rows of Table 2 illustrate that this seems to be the case and that we cannot reject the null hypothesis.

Given the random nature of non-economic news shocks and the lack of compelling evidence that these events are triggered by prevailing conditions of the US economy, we argue that these news are plausibly unrelated to economic factors. It is true that some institutional events (such as, the 1971 voting age amendment) may have been partly anticipated. However, our identification does not rely on the events themselves being *surprises*: what matters is the unexpected change in sentiment they produce. Even for events with known legislative timelines, the public emotional response, media framing, and perceived social mood are not predictable and vary at the quarterly or monthly frequency that we use. Consistent with this, the instrument strongly predicts consumer sentiment but does not forecast forward-looking economic fundamentals. Therefore, anticipation of the event does not undermine our interpretation of the instrument as capturing surprise movements in sentiment.

II EMPIRICAL RESULTS

II.I Macroeconomic effects of sentiment shocks

Figure 2 presents our baseline estimation results, where the proxy-VAR estimation includes the natural logarithm of consumer confidence index, output, and consumption spending, and consumer price index, interest rate, and unemployment rate. The impulse responses represent the percentage change in each variable in response to one percent increase in consumer confidence, along with the corresponding 68% and 90% confidence intervals. We observe that both consumption spending and output stay above their pre-shock levels for the duration of the forecast horizon, and the response remains significant at 90% confidence level

even after several quarters of the initial shock. Output increases significantly by 0.1 percent on impact and continues to rise after the initial shock. The peak response of consumption spending takes place roughly after two and a half years and is equal to 0.14 percent. The response persists for several more quarters and remains positive for the entire projection horizon.

The first graph in the second panel shows that a positive shock to consumer confidence has an expansionary effect also in the labour market. There is a persistently negative impact on unemployment rate due to a rise in consumer confidence, and unemployment rate remains below its pre-shock level for over three years. The largest reduction in unemployment takes place ten quarters after the initial shock and is equal to approximately 0.045 percentage points. This period roughly coincides with the time consumer spending and output are at their peak response levels. Nevertheless, the initial response of employment is not statistically significant, with relatively wide confidence bands immediately after the shock. This is also true for estimations based on monthly data, as described later. The point estimates become statistically significant several quarters after the shock, consistent with a gradual adjustment in job creation. This pattern is typical in VAR analyses of expectation shocks, where early responses of labour market aggregates can be imprecisely estimated due to differences in timings between survey-based sentiment indicators and employment data.

On the monetary side, the second panel reports the response of consumer price index to an increase in confidence. The response is negative and significant. A priori, one would expect the sentiment shock to induce an upward pressure on prices. Our estimates indicate no evident increase in consumer price index. One possible explanation for the lack of price increase comes from the monetary policy response where we observe no significant adjustment in the policy rate. The interest rate shows a negative response on impact, and later increases with a lag of one quarter. Nonetheless, the impact of sentiment on interest rate adjustments is not statistically significant. An increase in output without inflationary pressure could be

indicative of propagation of a positive sentiment shock mainly through the supply channel. A news-driven supply side shock would keep prices subdued even as consumption rises. This explanation appears to be consistent with the lack of a significant response of interest rate. As described in Section III, nonetheless, we detect a weak response of consumer prices to a rise in sentiment when using monthly time series data instead of quarterly data used in baseline estimations.

To sum up, our results are consistent with the findings reported in Lagerborg et al. (2023) and Barsky and Sims (2012) who find strong and persistent effects of positive sentimental shocks on macroeconomic aggregates. In a related study, Milani (2017) introduced sentiment in a medium-scale DSGE model of the U.S. economy to test the empirical contribution of sentiment shocks to business cycle fluctuations. The model incorporates consumer sentiment which represents waves of optimism and pessimism exogenous to the state of the economy. The results indicate that exogenous variations in sentiment account for roughly forty percent of historical U.S. business cycle fluctuations, and that confidence shocks related to investment decisions play the largest role. In our case, the rise in production and private sector consumption in combination with the an improvement of the labour market conditions seem to be consistent with the notion that autonomous changes in consumer sentiment are related to 'demand shocks', with some indication of news-driven supply-side adjustments. Nonetheless, the positive response of macroeconomic aggregates to a rise in consumer sentiment lasts longer in our case compared to that identified in existing studies. Lagerborg et al. (2023), for example, observe that the decline in industrial production in response to a negative sentiment shock is significant at the 68% level for just above 2 years and at the 90% level for around a year and a half, with the maximum drop occurring 7-12 months after the shock.

II.II Other variables

We also study the effects of sentiment shocks on different components of consumption. The impulse responses illustrated in Figure 3 show that all components of consumer spending depict a strong and persistent response to a positive shock to consumer confidence that lasts for several quarters and remains positive over the forecast horizon. Compared to the initial impact of a positive shock to sentiment on total consumption, the immediate response of durable consumption spending is smaller, but much larger for spending on services; one percent increase in consumer confidence results in nearly 0.08 percent increase in expenditure on services as opposed to 0.03 percent increase in the overall consumer spending. The expansionary impact does, nevertheless, hold for all types of consumer spending which is persistent and lasts for several quarters.

Interestingly, as depicted in Figure 4, the response of recreational spending is much larger in magnitude compared to the impact on total spending. The top panel in Figure 4 breaks down the effect of a positive sentimental shock on recreational spending on durable goods and services. It shows that one percent increase in consumer sentiment brings about almost 0.2 percent increase in durable goods recreational spending, and the response remains positive and statistically significant for almost two years. The expansionary effect on recreational services spending remains significant over the entire duration of forecast horizon.

We also extend the baseline proxy-VAR by including additional variables of interest to examine their response to shifts in consumer sentiment. The vector of observables is augmented with the TFP series of Fernald and Wang (2016). The second panel of Figure 4 suggests a positive effect of a sentiment shock on utilization adjusted total factor productivity. One percent increase in confidence results in about 0.075 percent rise in TFP, and the response remains positive over the duration of the forecast horizon; a rise in sentiment does have an overall positive and significant longer-term effect on productivity. We return to this discussion below.

Overall, we find that an autonomous increase in consumer confidence that we identify with an external instrument, sets off persistent improvement in the state of the economy. Confidence shocks last for approximately ten quarters, and parallel with this, production, employment, and consumer spending rise gradually but persistently, and these responses are statistically significant. On the other hand, the effect of sentimental shocks on interest rates mostly remains statistically insignificant. Our results show that the expansionary effects on various types of consumer spending display a similar pattern and persistence to the shock, and these effects are much stronger for expenditure on services and recreational spending.

II.III Animal spirits or news about TFP?

A large theoretical literature offers mechanisms for sentiment-driven business cycles (Benhabib et al., 2015). Sentiment may be used to describe economic agents' views of future economic developments that may drive the economy because they influence agents' decisions today (Nowzohour and Stracca, 2020). The literature on news and anticipated shocks emphasizes on news about future technology or productivity changes as sources of fluctuations (Beaudry and Portier, 2006). Agents have access to a non-measurable source of (imperfect) information about future developments of the economy which affects their economic decisions today (Barsky and Sims, 2012; Schmitt-Grohé and Uribe, 2012; Blanchard et al., 2013; Beaudry and Portier, 2014). Thus, the economy is subject to recurrent booms if the signal is correct and occasional busts after the initial boom prior to the realization of the signal being false (Nowzohour and Stracca, 2020).[10]

<Table 3 here>

Do the identified sentiment shocks based on non-economic news events represent animal spirits? Innovations to consumer confidence may contain longer term incremental information about economic activity, possibly reflecting either a causal effect of animal spirits on

economic activity, or news about exogenous future productivity, or both. Hussain (2015) shows that total factor productivity responds to shocks to consumer confidence but that may be general equilibrium effects. Barsky and Sims (2012) build an augmented New Keynesian model and use impulse responses to confidence innovations to show that the association between confidence and future economic activity is almost entirely captured by the news component. They use a DSGE model to show that news about future technology changes explain the relationship between confidence shocks and macroeconomic variables, and similar to Beaudry and Portier (2006), conclude that innovations to sentiment represent news about future TFP, since autonomous innovations to beliefs have only a transitory effect on output.

We test whether our instrument Granger causes productivity shocks. Table 3 presents test statistics for a Granger test estimating a VAR including lagged values of TFP together with the news instrument series. The top row shows that the p-value of the Granger causality test comes out to be 0.35 for the non-economic news shock series when 4 lags are used, and 0.44 when 8 lagged values are included. These statistics suggest that we cannot reject the null hypothesis that all coefficients are jointly zero. Thus, it appears that the sentiment shock identified with the external IV is not simply a news shock related to productivity.

The positive response of utilization-adjusted TFP observed in Figure 4 is consistent with earlier work. There are several papers that support this view. For example, Basu and Fernald (2001) show that measured aggregate productivity reflects not only true technological change but also non-technology components, including time-varying markups and the reallocation of inputs across firms with different marginal products, even after accounting for factor utilization. The utilization-adjusted TFP should, therefore, not be interpreted as a pure technology measure. Consistent with this interpretation, Fernald (2014) notes that their quarterly utilization-adjusted TFP series does not remove all non-technological influences on measured productivity. Furthermore, Crouzet and Eberly (2021) argue that movements in measured U.S. TFP can reflect changes in markups and intangible (organizational) invest-

ment, rather than changes in the underlying technological efficiency. In our context, the results highlighted in these studies support our identification strategy by reinforcing that utilization-adjusted TFP should not be interpreted as a one-to-one measure of technology shocks.

To sum up, while the news shocks considered in this study could, in principle, influence the economy through alternative channels, such as, firms or government actions, rather than purely through consumer sentiment, our estimates of Granger-causality tests suggest that the identified sentiment shocks are not simply capturing news about future productivity. This is consistent with the 'animal spirits' interpretation, in line with Lagerborg et al. (2023). Together, these results provide support for the exclusion restriction underlying our identification strategy.

II.IV Business cycle contributions

In this section, we study the contributions of shocks to consumer confidence to business cycle variations. We do this by computing the forecast-error variance decompositions (FEVDs) using the plug-in estimator of Montiel Olea et al. (2021a).[11] The FEVD is given by:

$$\widehat{FEVD}_{i,h} = \frac{\sum_{s=0}^{h} \left(e_i' C_s(A) b\right)^2}{\sum_{s=0}^{h} e_i' C_s(A)\, \Sigma\, C_s(A)'\, e_i}.$$

where i indexes the variable and h the forecast horizon; b is the impulse vector associated with the identified structural shock; $C_s(A)$ are the moving-average coefficient matrices implied by the estimated VAR; Σ is the covariance matrix of the reduced-form residuals; and e_i is a selection vector that extracts the ith element. We adopt the standard unit-variance normalization $b'\Sigma^{-1}b = 1$, so that the numerator represents the cumulative contribution of

the identified shock to the forecast-error variance of variable i up to horizon h, while the denominator represents the total cumulative forecast-error variance over the same horizon.[12]

Figure 5 presents the points estimates along with the identified-set bounds implied by the instrument strength and dynamic feasibility conditions (Montiel Olea et al., 2021a). The figure shows that point estimates for consumer confidence lies in 50-60% range. However, the confidence bands are wide with the lower bound estimates around 4.5%. For output, the FEVD estimates are in the 15-20% range at shorter horizons and increase at longer horizons. For personal consumption expenditure, the FEVD estimates lie in the 20-30% range at shorter horizons and become larger at longer horizons. Shocks to consumer confidence do not contribute little towards business cycle fluctuations of unemployment at short horizons with the FEVD estimates being below 10%. At longer horizons, the estimates reach as high as almost 20%. For CPI, the FEVD estimates remain in the 20-30% range throughout the forecast horizon. And finally, for interest rate, the FEVD estimates never become too big and remain below 5%. The confidence bands for all of these variables are rather wide.

III ROBUSTNESS

Our baseline estimates rely on the use of responses to surveys conducted in the wake of major non-economic news events in the United States as an instrument for consumer sentiment. In this section, to address potential sources of measurement error and general survey and polling data issues, we investigate the robustness of the results described in the last section to alternative versions of our instrument and estimation methodologies. Carriero et al. (2015) report no bias in results when an instrument with measurement error is used in a proxy-VAR model. Nonetheless, we employ alternate definitions of the identified sentiment shocks and consider numerous extensions to the baseline specification. We perform a placebo test where the non-zero instrument values are assigned to random dates. The estimates based on an

augmented-VAR (VARX) model are also provided, where the instrument is included in the VAR as an exogenous variable.[13]

III.I Measurement error

To test the robustness of our findings to alternate versions of the external instrument, we perform three main exercises. First, we use an alternative assignment of events in quarterly time series data by assigning events that take place in the last month of each quarter to the following quarter. This exercise is motivated by the expectation that an event happening late in a quarter may not influence sentiment in that quarter. Instead, it may have a lagged effect on consumer confidence that projects itself only in the following quarter. Second, we use a dummy variable for negative and positive news as the IV, instead of relative scores associated with news events used in the baseline estimation. The test statistics reported in Table 4 offer evidence in favour of the relevance assumption for both of these alternate forms of instruments. Third, we try an alternate grouping of *no opinion* responses. Instead of combining *no opinion* or no-response percentages to the category with a lower score, we include it with the majority (positive or negative) response category.

<Table 4 here>

The impulse responses presented in Figure 6 illustrate the estimated effects of a percentage increase in identified sentiment shock when alternatively assigning events that take place in the last month of the quarter to the subsequent quarter. Figure 7 presents these effects for positive and negative news shocks indicator variables. To ease comparison, red dashed lines representing baseline estimates are imposed on the impulse responses. In both cases, the impulse responses are nearly identical to those generated in the baseline estimation. In the former case, however, the peak responses of consumption spending and production are lower compared to the baseline results. On the other hand, the initial labour market

impact appears to be more pronounced with a 0.04 percentage point drop in unemployment rate upon impact. Figure 7 shows a positive response of interest rate on impact, that appears to persist over several quarters. Lagerborg et al. (2023) highlight a similar policy response of nominal interest rate adjustment to a drop in output as a result of a negative shock to consumer sentiment. Nonetheless, the impact of sentiment shocks on interest rate adjustments is once again not statistically significant. In addition, the effect on prices is much smaller in magnitude when news indicators are used instead of relative scores, with much wider confidence bands.

III.II Monthly data

Our analysis also uses monthly data to quantify the effect of changes in consumer confidence and expectations on macroeconomic variables. A large body of literature supports the notion of sticky expectations as a possible reason for relatively slow responses to shocks and the frequency at which people update their expectations. For instance, Carroll (2003) reports that expectations about employment are updated on average once a year, while Doms and Morin (2004) conclude that expectations about employment prospects are updated within a couple of months. In this section, we report a significant impact of changes in consumer sentiment on output and employment over the months immediately following the confidence shock.

Figure 8 illustrates the impulse responses estimated for monthly data using Eq. 2, over January 1978 to December 2022.[14] Since GDP is not available at the monthly frequency, we use industrial production index in its place. The results are once again qualitatively very similar to the baseline results, and appear to be slightly stronger and more persistent for output. However, there are some differences. The second panel in Figure 8 shows that the impact on unemployment rate remains statistically insignificant during the months immediately after the sentiment shock, but represents an approximately 0.035 percentage

point significant decline in unemployment rate one year after the shock. The impact fades away over four years. On the monetary side, interestingly, the response of consumer price index is not significant any more, in contrast to the original findings based on quarterly data. This is also true for policy rate response.

III.III Economic news

We have shown earlier that the series of identified sentiment shocks are orthogonal to other structural shocks, and that shocks to economic fundamentals do not Granger cause sentiment shocks identified by our IV (see Table 2). Given the random nature of news shocks analysed in this study, these events are plausibly unrelated to other economic factors and are not predictable on the basis of past information. Nonetheless, the subjective nature of the survey response measures employed for our purpose may possibly be affected by the state of the economy. At the same time, there may also be other dimensions of autonomous shocks to confidence that our IV is not able to fully recover. In this section, we alleviate such concerns by allowing for this possibility and checking for a chance correlation between non-economic news shocks and shocks to economic fundamentals.

We study the response of aggregate uncertainty by controlling for Economic Policy Uncertainty Index (EPU) in the baseline proxy-VAR. The news coverage-based indicator has been made available at a monthly frequency since 1900, and is constructed through a search of key words from 10 newspapers in the United States (Baker et al., 2016).[15] Figure 9 shows the impact of sentiment shocks on economic uncertainty, together with other endogenous variables. The impulse responses indicate a negative and significant impact of sentiment shocks on EPU. The observed impact of the shock on other macroeconomic indicators reflects very similar pattern as documented in the baseline proxy-VAR estimation. Therefore, we find no evidence of sentiment shocks being confounded by economic policy uncertainty, and EPU does not Granger cause the identified news shocks.

III.IV A placebo test

To test whether the estimation results described so far depend on the external instrument constructed in this study, we conduct a placebo test. We reshuffle the IV by assigning non-zero instrument values to random dates, following Lagerborg et al. (2023). The dates of major news shocks are drawn from a uniform distribution, and this process is repeated 10,000 times. The median point estimates of the impulse responses along with 68% and 90% bands using percentile method are depicted in Figure 10. It shows that the instrument in the placebo exercise is insignificant, and we observe no significant effects in impulse responses for all macroeconomic variables.

As an additional test, we also derive dynamic causal effects using a local projection estimator (LP-IV) which imposes less restrictive assumptions compared to our baseline estimation methodology. A proxy-VAR framework assumes that the shocks can be derived from current and past values of observables. Since the impulse responses are normally calculated as linear combinations of model coefficients, extrapolating these combinations at increasingly distant horizons can compound any misspecification errors (Jordà, 2005). Following the methodology used in Stock and Watson (2018) and Plagborg-Møller and Wolf (2021), we show that the response of output is qualitatively very similar to the response estimated through the proxy-VAR. The confidence bands, nonetheless, are much wider.[16] While the proxy-VAR estimation offers greater precision, there is a potential misspecification bias at longer horizons. The LP approach, on the other hand, is more robust to misspecification, but since it estimates parameters for each projection horizon, local projection estimation results in a loss of precision (Olea et al., 2025). The larger and delayed peaks in LP-IV estimates indicate that sentiment shocks may trigger more persistent responses than what proxy-VAR captures; the transmission of confidence shocks and expectational shifts may plausibly be more drawn out, and LP estimates reflect these delayed dynamics.

IV CONCLUSION

The key sources of business cycle fluctuations are typically shown to be shocks to demand (such as, exogenous shifts in preferences, and monetary and fiscal policies), shocks related to technology, or to changes in market power (such as, price and wage shocks). A majority of existing studies do not consider *non-fundamental expectational shifts*, such as, consumer confidence swings that are not necessarily motivated by economic fundamentals. For instance, following the Great Recession, and more recently, after the COVID-19 pandemic, a decline in consumption is widely believed to be prompted by expectational shifts. A growing literature in macroeconomics has added consumer sentiment and behavioural elements to macroeconomic frameworks. Although economists generally agree on the plausibility of a correlation between sentiment and economic developments, the existence of a correlation does not necessarily shed light on the underlying transmission mechanisms.

We contribute to the emerging literature attempting to causally identify the role of subjective expectations and consumer confidence in explaining macroeconomic fluctuations. To check whether the beliefs captured in consumer confidence surveys significantly affect consumption spending, we construct a novel instrument based on non-economic news shocks in the United States over 1969-2022, and opinion polls conducted following these events. The IV approach adopted in this study introduces novel variation in consumer sentiment associated with news shocks plausibly orthogonal to economic fundamentals, and explores whether innovations to consumer sentiment have a significant effect on key macroeconomic aggregates. The instrument explains significant variation in consumer confidence. We find that an increase in the identified sentiment has an expansionary effect on the US economy. In particular, following a positive confidence shock, there is a strong and persistent increase in consumption, output, and employment levels. Lastly, we validate these results using various robustness checks and by conducting a number of sensitivity analyses.

Our results offer key policy implications. Our findings align with the existing work suggesting that consumer sentiment has a casual effect on spending plans. Due to high-frequency sentiment shocks and large movements in confidence levels observed in our data, the identification strategy adopted in this study ensures that the variation in consumer confidence characterizes pure sentiment shocks rather than a response to news about the state of economy. Measures of consumer sentiment, therefore, capture a key component of the level of economic activity, namely consumption spending plans, not fully revealed by other macroeconomic indicators. It is, therefore, crucial for policy makers to appropriately design stabilization policies in the wake of major economic as well as non-economic news events that may appear to be less important sources of macroeconomic fluctuations. An equally critical policy objective should be to project more confidence in the future outlook of the economy to mitigate the potentially weakening consequences of negative shocks to sentiment. The sharp decline in consumer confidence index witnessed in March 2025, which measures US consumers' assessment of the current economic conditions and their outlook for the next six months, reflects elevated anxiety due to the announcement of tariffs on many imported goods, and more generally, mounting concerns about the future of the economy. We show that consumer pessimism and growing uncertainty alone are associated with contractionary effects that are often persistent and can signal a probable recession.

It would be interesting to identify and analyse other indicators of expectations that may have an impact on the state of the economy. The results presented in the current article suggest that identified shocks are not news about future movements in productivity. Our future research goal is to shed more light on the underlying transmission mechanisms for the relatively longer term effects discussed in this paper, and relate new empirical evidence on consumer sentiment shocks to economic theory. An important question not addressed in this article regards the asymmetric effects of positive versus negative news shocks on the economy. According to preliminary results not reported here, positive news is associated

with longer lasting consequences. On the other hand, negative news events bring about strong but short-lived effects.

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NOTES

[1]For instance, it includes response to the question, "do you think that a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?"

[2]Later in the paper, we address potential measurement issues related to surveys and polling data.

[3]Al-Amine and Willems (2023) report that the negative effect is particularly stronger for manufacturing output and exports, representing Dutch disease-type dynamics.

[4]In an instrumental variable approach, Beaudry and Willems (2022) use the randomness in country allocation of IMF mission chiefs, that often differ in their individual degrees of forecast optimism, to show that overly optimistic growth expectations bring about economic contractions a few years later.

[5]According to Pigou (1927), business cycles are largely driven by movements in expectations, and entrepreneurs' errors of optimism and pessimism are key drivers of fluctuations in real activity. Expectations about future economic outcomes may affect choices today through intertemporal substitution. For example, according to the consumption Euler equation, consumption spending today is a function of expectations about future economic outcomes.

[6]Although the sample size for each month used to be close to 1000 households, since 1988, it has been lowered to about 500 households. As described in Lahiri and Zhao (2016), half of the households that are interviewed in the current month's survey are re-interviewed six months later, creating a short panel where each cross-sectional unit appears twice in the survey.

[7] *Regents of the University of California v. Bakke*, 438 U.S. 265 (1978), was a landmark decision by the Supreme Court that involved a dispute over whether preferential treatment for minorities could lower educational opportunities for whites without violating the Constitution. It began when a medical school applicant, Allan Bakke, claimed that the University of California at Davis had practised unfair discrimination by denying him admission two years in a row while accepting less qualified minority applicants.

[8] There are a number of other studies that implement the proxy-SVAR estimator, such as, Hussain and Liu (2024), and Gertler and Karadi (2015).

[9] Katona (1975) emphasized the significance of mass media information and interpersonal communication to describe the relative stability of consumer sentiment.

[10] Levchenko and Pandalai-Nayar (2020) provide an account of the international propagation of business cycles with the help of a theoretical framework to illustrate how the US sentiment shocks can transmit to Canada. They propose an identification scheme for a non-technology business cycle shock, labelled as sentiment, which is orthogonal to the identified surprise and news TFP shocks, maximizing the short-run forecast error variance of an expectational variable, such as, consumer confidence index.

[11] The published article presents the main results; the derivations of the plug-in FEVD estimator appear in an Online Appendix, available at Montiel Olea et al. (2021b).

[12] Because this object is based entirely on cumulative forecast-error variances, it is algebraically equivalent to the forecast-variance ratio (FVR) studied by Plagborg-Møller and Wolf (2022). Their results imply that proxy-based variance decompositions are set-identified, with the shock scale bounded by instrument strength and dynamic feasibility. We therefore report the corresponding identified-set bounds, while using the Montiel Olea et al. (2021a) plug-in estimator for the FEVD point estimates.

[13] See Supplementary Appendix. Paul (2020) shows that this methodology estimates true relative impulse responses even when the instrument contains measurement error that is orthogonal to other variables.

[14] For monthly data, we use nine lags of the endogenous variables and one-month lagged news variable as the external instrument. This choice yields the strongest first-stage fit and aligns with the timing of consumer sentiment data collection.

[15] Source: `https://www.policyuncertainty.com/`

[16] These results are discussed in a Supplementary Appendix.

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Table 1. Data Sources

Variable	Source
Real GDP	FRED - Series GDPC1
PCE and components	BEA Table 1.1.3
Unemployment[1]	FRED - Series UNRATE
Interest Rate[2]	FRED - Series FEDFUNDS
Consumer Price Index	FRED - Series ID: CPALTT01USQ661S
Recreation Durables	BEA Table: 2.3.3
Recreation Services	BEA Table: 2.3.3
Total Factor Productivity	Fernald and Wang (2016)
Economic Policy Uncertainty index[3]	Baker et al. (2016)
Monthly data:	
Industrial Production Index	FRED - Series INDPRO
Interest Rate	FRED - Series FEDFUNDS
Consumption	BEA Table 2.8.3
Consumer Price Index	FRED - Series ID: CPALTT01USM661S

[1] End of quarter value
[2] End of quarter value
[3] We use the news based uncertainty index.

Table 2. Instrument strength

Dependent	Independent	Test Type	Test Statistic	p-value
CC Growth	News	Linear	13.57 (F)	0.00
CC Growth	News (monthly)	Linear	3.04 (F)	0.08
News	dy, dpce, du, dr, dcpi	Granger	17.44 (χ^2)	0.64
News	dy, dpce, du, dr, dcpi	Oprobit	21.88 (χ^2)	0.35

Note: The table reports test statistics for the strength of the instrument. The top panel presents estimation results of F-tests for the null hypothesis that the instrument coefficient is zero in the first stage regression for consumer confidence. The bottom panel reports Granger causality and ordered probit test statistics for estimations obtained by regressing relative scores of non-economic news shocks on macroeconomic aggregates.

Table 3. Animal spirits or news about TFP?

Dependent	Independent	Test Type	Test Statistic	p-value
TFP	News Instrument	Granger (4 lags)	4.40 (χ^2)	0.35
TFP	News Instrument	Granger (8 lags)	7.95 (χ^2)	0.44

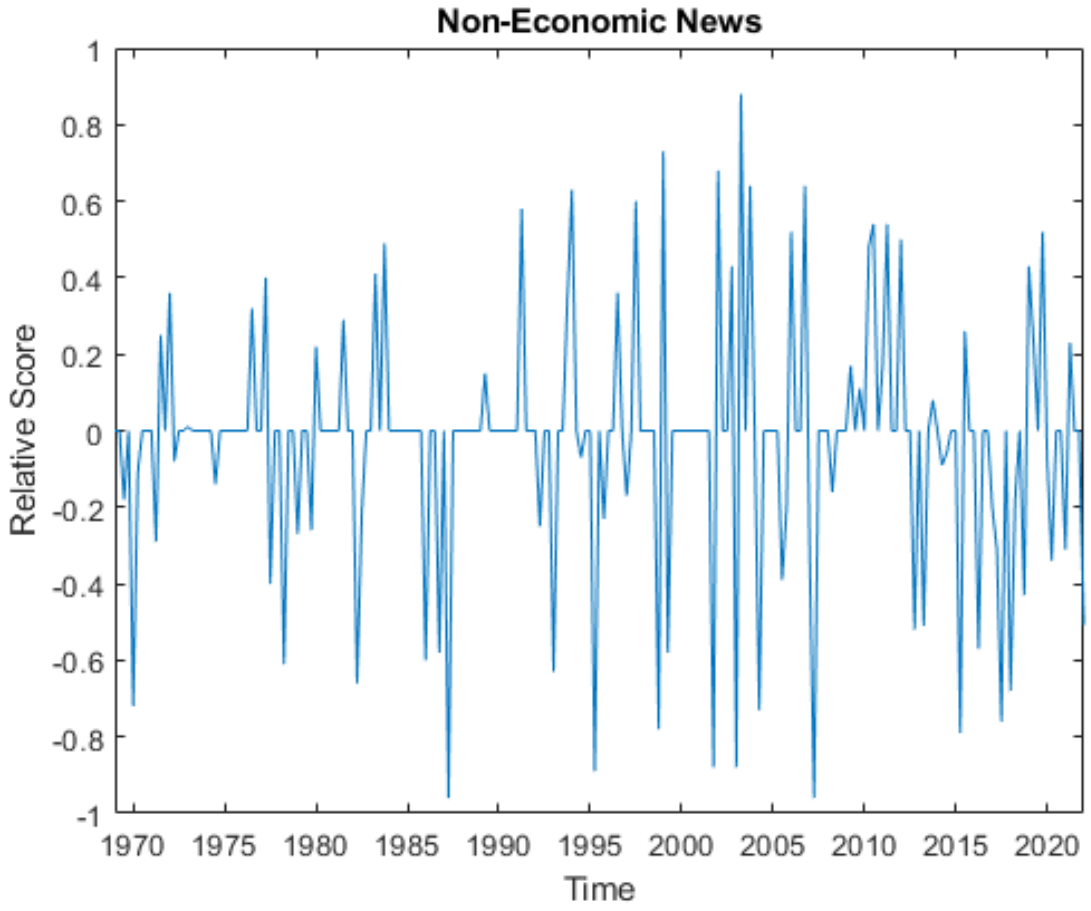
Note: The table presents estimation results from Granger causality test. We estimate a VAR which includes lags of TFP together with the news instrument series.

Table 4. Measurement error

Dependent	Independent	Test Type	Test Statistic	p-value
CC Growth	News (Alternate)	Linear	9.76 (F)	0.00
CC Growth	News Dummy	Linear	14.52 (F)	0.00

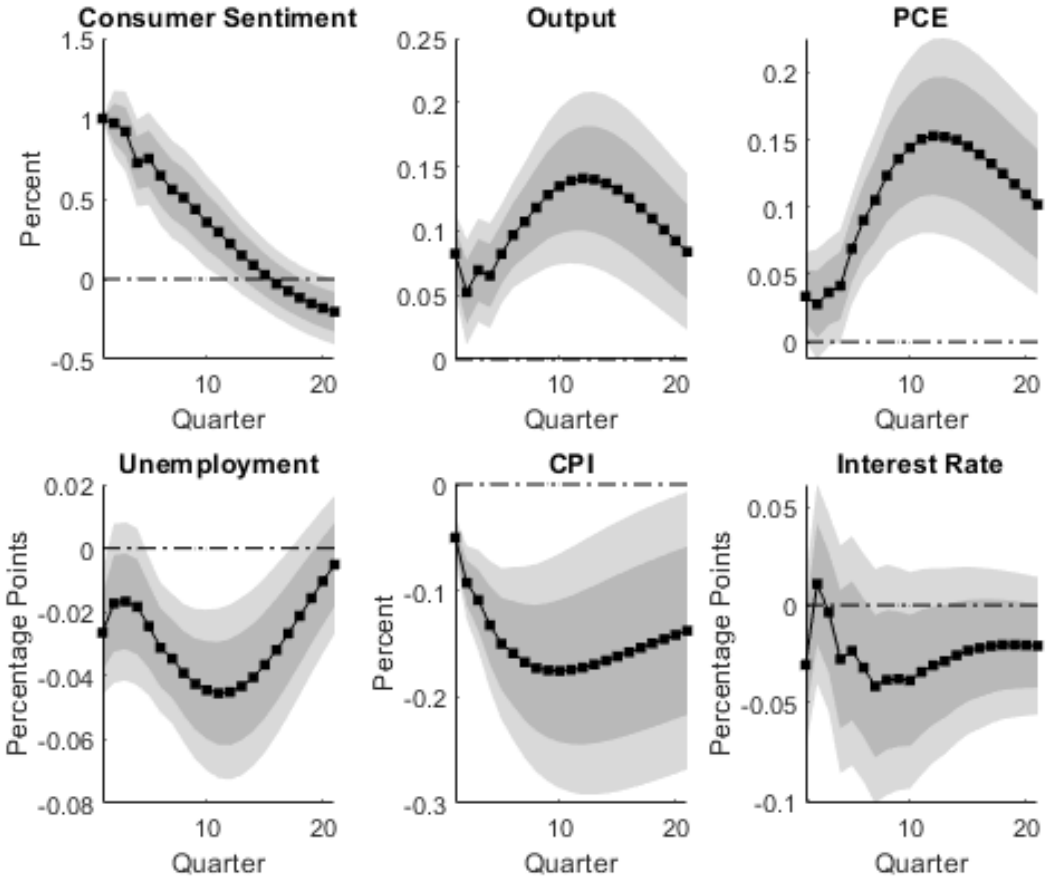
Note: The table reports test statistics based on alternative measures of non-economic news shocks instruments. The top row presents estimation results of F-tests for the null hypothesis that the alternate instrument coefficient is zero in the first stage regression for consumer confidence. The second row reports F-test statistics for the alternate instrument of news indicators instead of using relative scores of non-economic news shocks.

Figure 1. News shocks: Relative scores



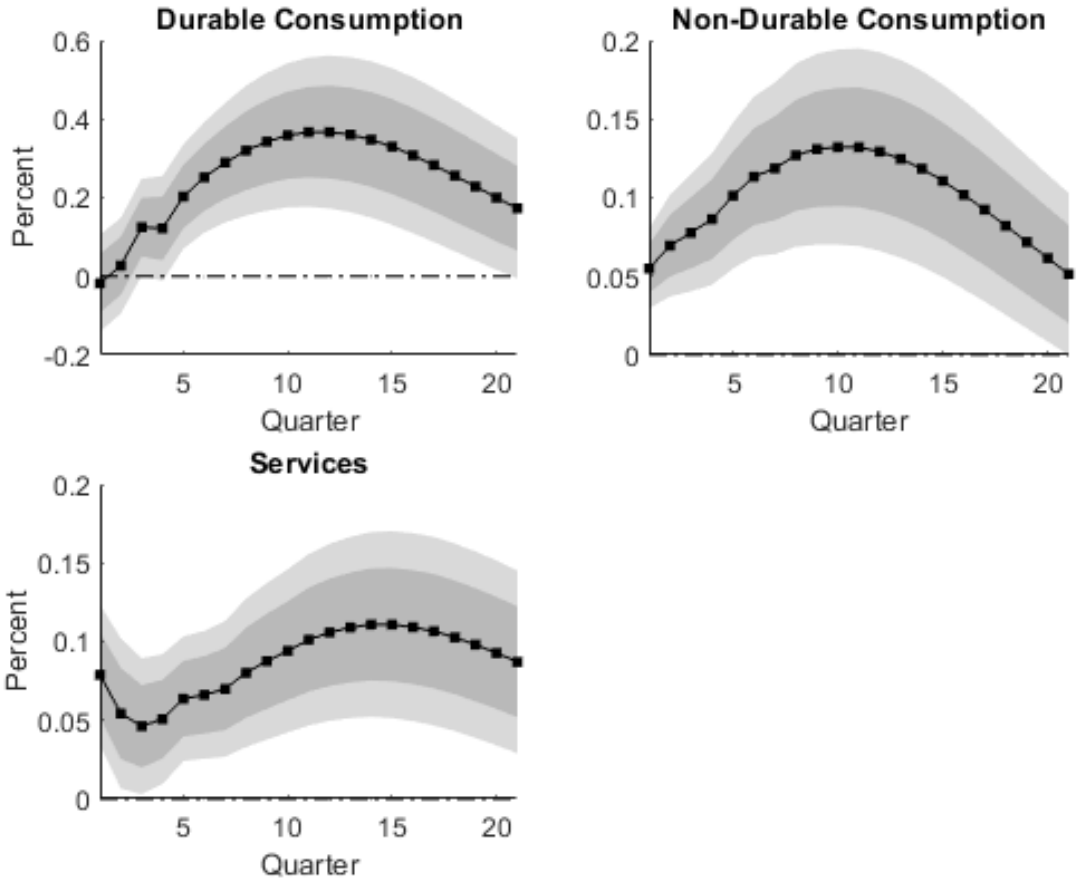
Note: The figure shows relative scores for non-economic news shocks from 1969:1 to 2022:4 (quarterly data) based on Eq. 1 computed using: Relative score = (Positive response - Negative response)/100.

Figure 2. Effect of consumer sentiment shocks



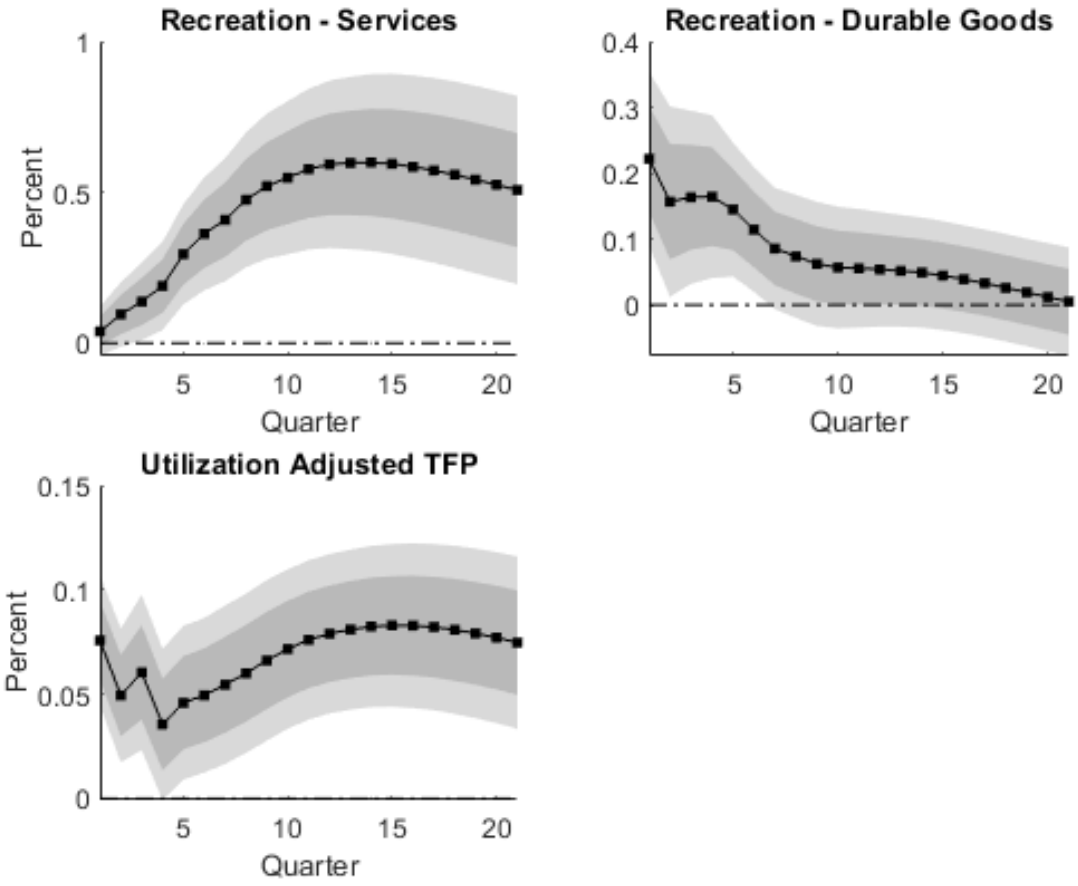
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method. We include log consumer confidence, log output, log consumption spending, consumer price index, interest rate, and unemployment rate in the baseline estimation. Consumer confidence shocks are identified by using the series of relative scores for non-economic news shocks as a proxy or instrumental variable over quarterly data, 1969:1-2022:4. The shaded areas are 68% and 90% confidence intervals. The initial impact on consumer confidence is normalized to be equal to 1%. Standard errors are calculated using recursive wild bootstrap method.

Figure 3. Components of consumption



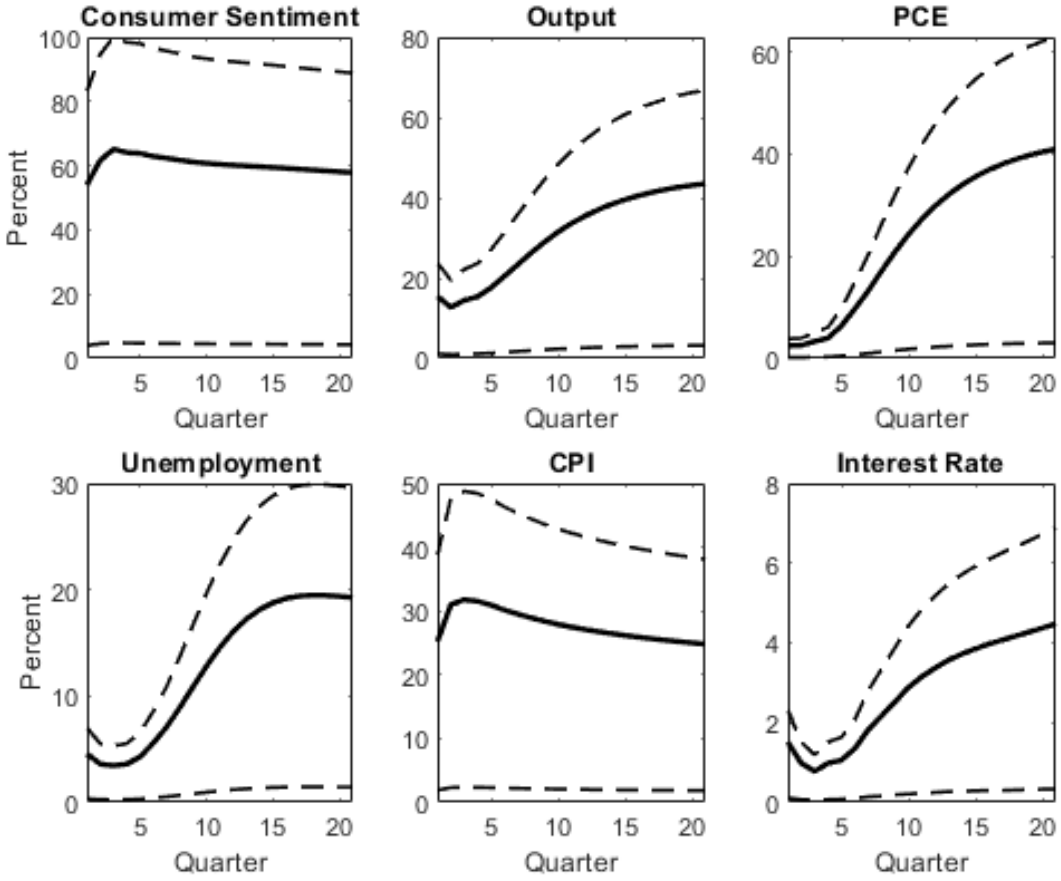
Note: The figure presents the effects of consumer confidence shocks on components of consumer spending (durables, non-durables, and services) estimated using the proxy-VAR method. We include log consumer confidence, log output, log consumption, consumer price index, interest rate, and unemployment rate in the estimation. Consumer confidence shocks are identified by using the series of relative scores for non-economic news shocks as a proxy or instrumental variable over quarterly data, 1969:1-2022:4. The shaded areas are 68% and 90% confidence intervals. The initial impact on consumer confidence is normalized to be equal to 1%. Standard errors are calculated using recursive wild bootstrap method.

Figure 4. Other variables



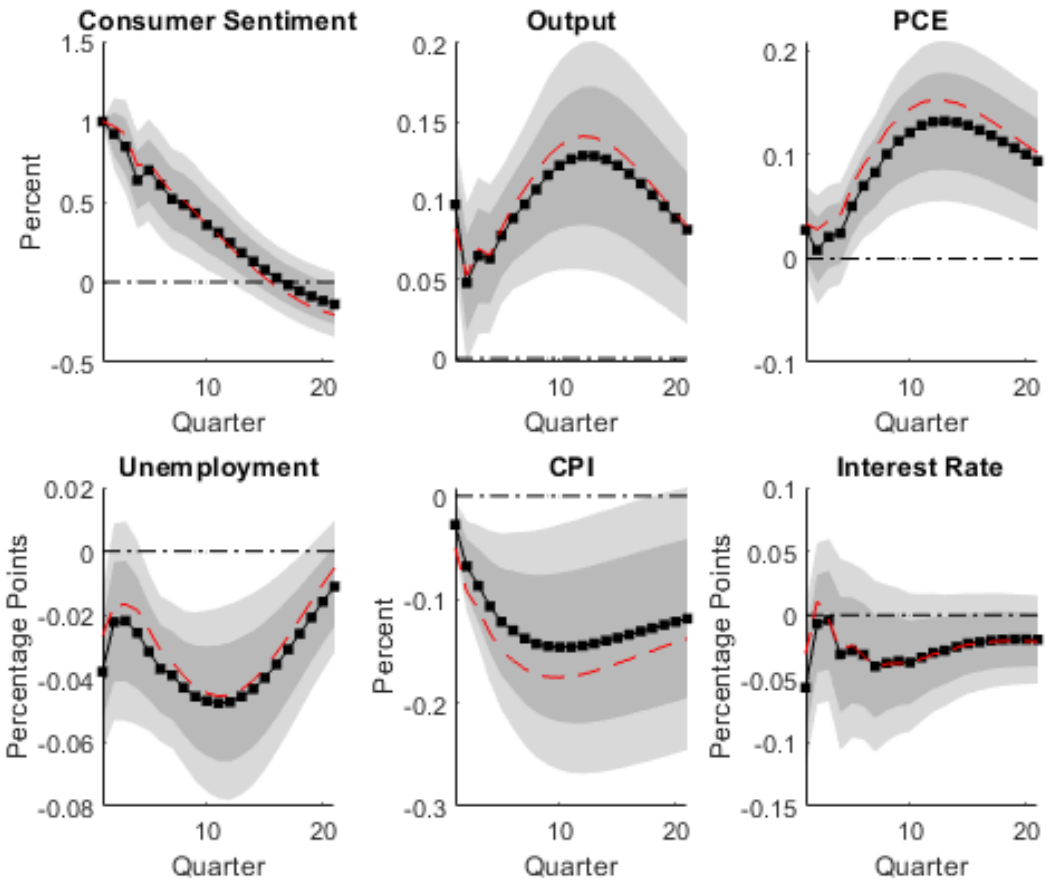
Note: The figure presents the effects of consumer confidence shocks on components of consumer spending (recreation - durable goods and services), and utilization adjusted TFP, estimated using the proxy-VAR method. We include log consumer confidence, log output, log consumption, consumer price index, interest rate, and unemployment rate in the estimation, along with these variables. Consumer confidence shocks are identified by using the series of relative scores for non-economic news shocks as a proxy or instrumental variable over quarterly data, 1969:1-2022:4. The shaded areas are 68% and 90% confidence intervals. The initial impact on consumer confidence is normalized to be equal to 1%. Standard errors are calculated using recursive wild bootstrap method.

Figure 5. Business cycle contributions: Forecast-error variance decompositions



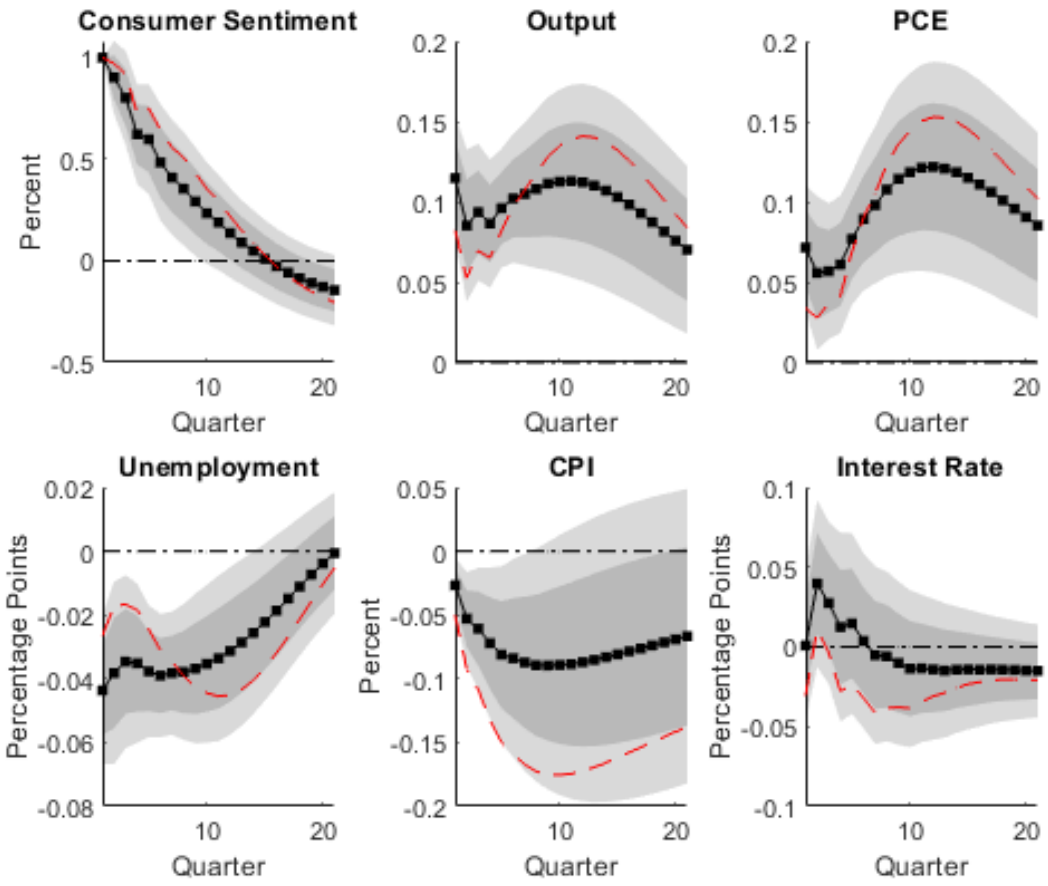
Note: The figure presents the points estimates along with the identified-set bounds implied by the instrument strength and dynamic feasibility conditions (Montiel Olea et al., 2021a). Consumer confidence shocks are identified by using the series of relative scores for non-economic news shocks as a proxy or instrumental variable over quarterly data, 1969:1-2022:4.

Figure 6. Measurement error: Alternative dates



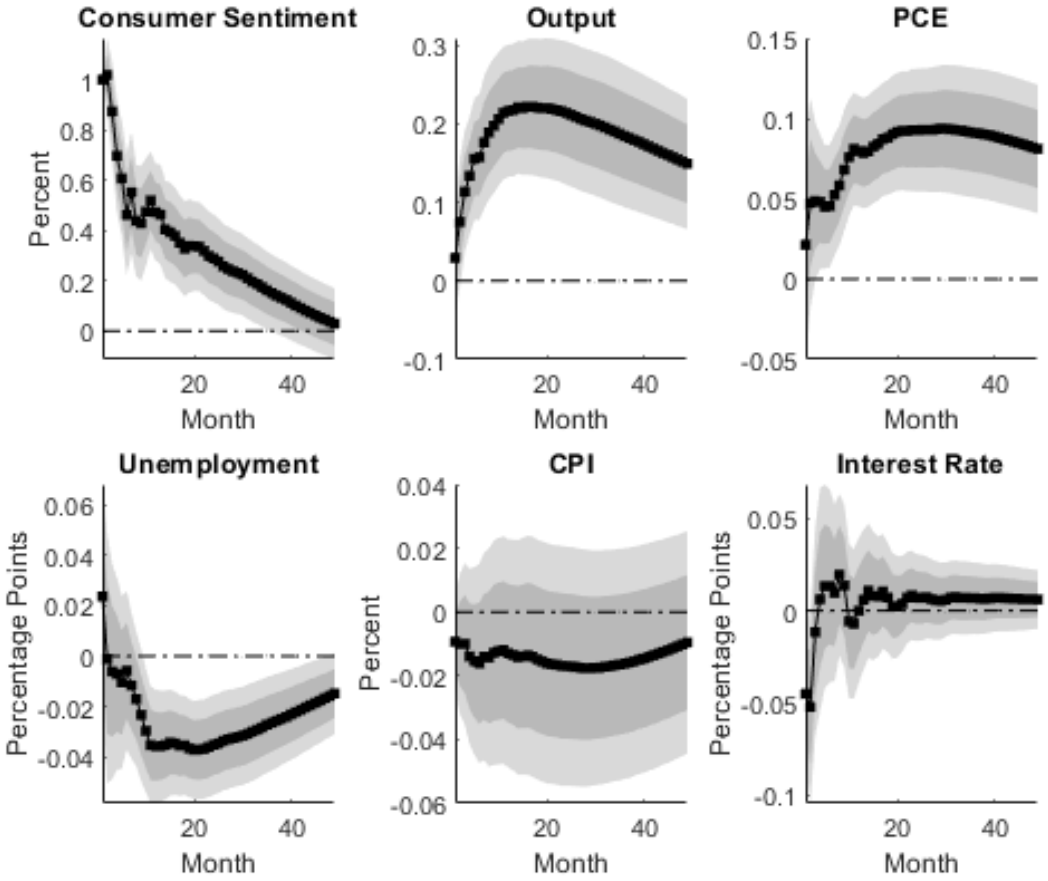
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method based on alternative grouping of non-economic news events in the quarterly data, 1969:1-2022:4. We include log consumer confidence, log output, log consumption spending, consumer price index, interest rate, and unemployment rate in the estimation. Consumer confidence shocks are identified by using the series of relative scores for non-economic news shocks as a proxy or instrumental variable. The shaded areas are 68% and 90% confidence intervals. The initial impact on consumer confidence is normalized to be equal to 1%. Standard errors are calculated using recursive wild bootstrap method. The red dashed lines represent baseline estimation results.

Figure 7. News indicators



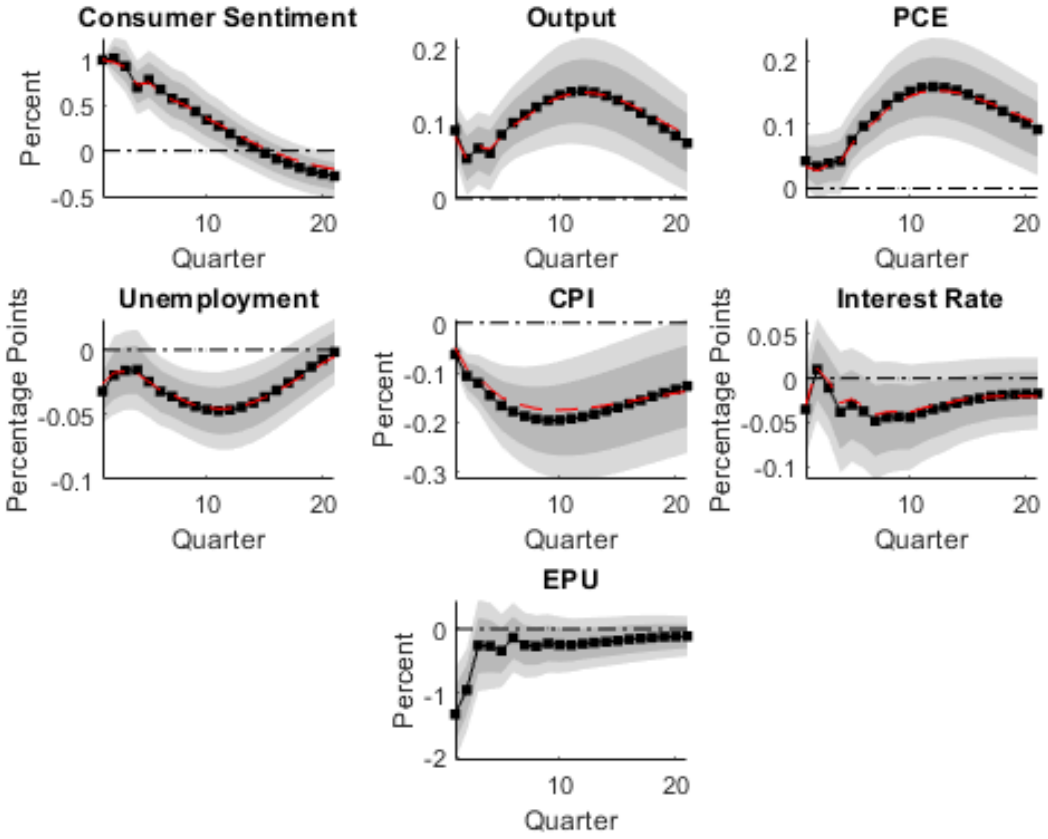
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method based on news dummy variables for the quarterly data, 1969:1-2022:4. We include log consumer confidence, log output, log consumption spending, consumer price index, interest rate, and unemployment rate in the estimation. Consumer confidence shocks are identified by using the series of relative scores for non-economic news shocks as a proxy or instrumental variable. The shaded areas are 68% and 90% confidence intervals. The initial impact on consumer confidence is normalized to be equal to 1%. Standard errors are calculated using recursive wild bootstrap method. The red dashed lines represent baseline estimation results.

Figure 8. Measurement error: Monthly data



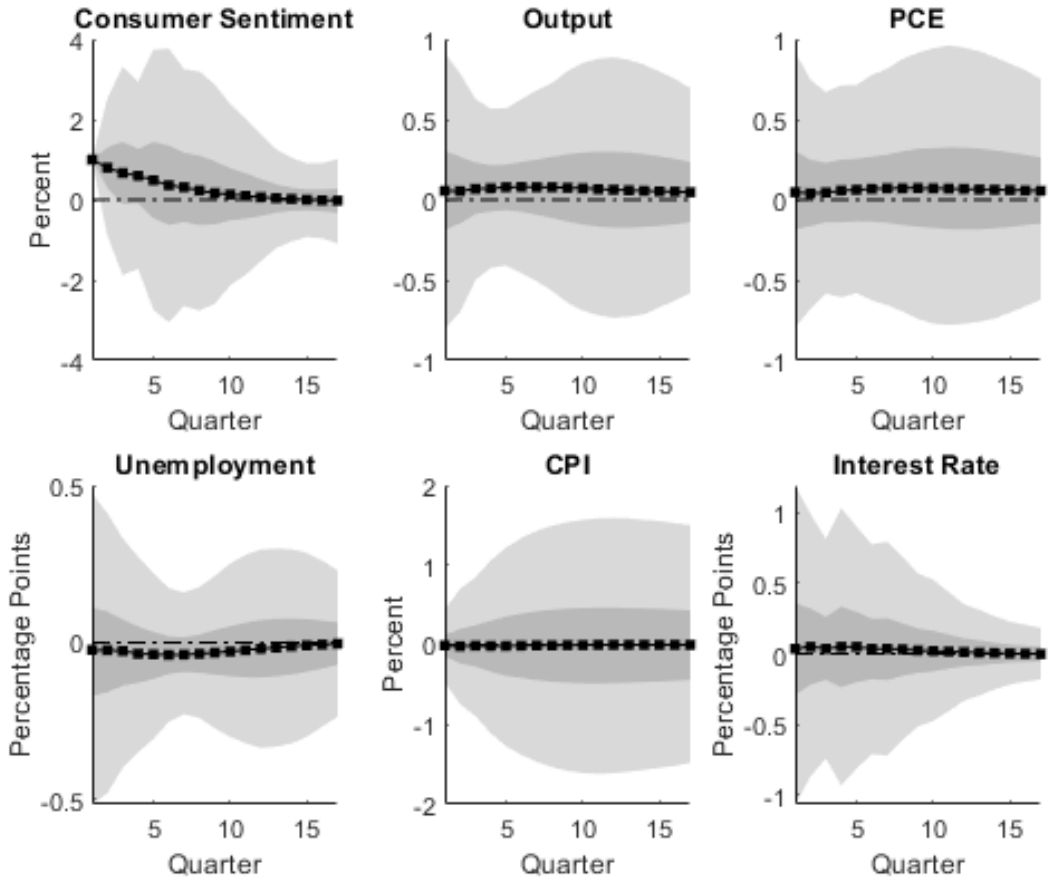
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method for monthly data, 1978:1-2022:12. We include log consumer confidence, log industrial production index, log consumption spending, consumer price index, interest rate, and unemployment rate in the estimation. Consumer confidence shocks are identified by using the series of relative scores for non-economic news shocks as a proxy or instrumental variable. The shaded areas are 68% and 90% confidence intervals. The initial impact on consumer confidence is normalized to be equal to 1%. Standard errors are calculated using recursive wild bootstrap method.

Figure 9. Economic news shocks



Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method for quarterly data, 1969:1-2022:4, after controlling for economic news. We include Economic Policy Uncertainty index, log consumer confidence, log output, log consumption spending, consumer price index, interest rate, and unemployment rate in the estimation. Consumer confidence shocks are identified by using the series of relative scores for non-economic news shocks as a proxy or instrumental variable. The shaded areas are 68% and 90% confidence intervals. The initial impact on consumer confidence is normalized to be equal to 1%. Standard errors are calculated using recursive wild bootstrap method. The red dashed lines represent baseline estimation results.

Figure 10. Placebo test



Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method for the placebo test where the non-zero instrument values are assigned to random dates. We include log consumer confidence, log output, log consumption spending, consumer price index, interest rate, and unemployment rate in the estimation, for the quarterly data, 1969:1-2022:4. The shaded areas are 68% and 90% confidence intervals. The initial impact on consumer confidence is normalized to be equal to 1%. Standard errors are calculated using recursive wild bootstrap method.