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News Shocks, Consumer Confidence, and Business Cycles

Syed M. Hussain
James Madison University

Zara Liaqat
Wilfrid Laurier University

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Syed M. Hussain† Zara Liaqat‡

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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.

JEL Classification: C36, E24, E32, F44
Key Words: Consumer confidence; Instrumental variables; Dynamic causal effects; Sentiment

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†Department of Economics, James Madison University, Harrisonburg, VA, USA. Email: hussa2sm@jmu.edu

‡Department of Economics, Wilfrid Laurier University, Waterloo, Canada. Email: zliaqat@wlu.ca

1 Introduction

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 labor 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 - as 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 state of the economy. Our instrument, thus, satisfies the exclusion restriction of affecting macroeconomic aggregates only through sentiment, and not through economic fundamentals.

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 all 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 behavior 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.

[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.

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 also derive dynamic causal effects using a local projection estimator (LP-IV) which imposes less restrictive assumptions compared to our baseline estimation methodology (Jordà, 2005).

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 labor 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.

We also consider the possibility that consumer confidence data may not only reflect households' views on the economy, but also could be suggestive of sentiments derived due to 'surprise' news, or unexpected economic shocks. An unanticipated economic news shock may, therefore, serve as an instrument that has a significant impact on sentiment, but is arguably not directly related to economic fundamentals. Consequently, as an extension of our baseline estimates, we construct an alternate IV as the difference between actual and predicted values of key macroeconomic variables as measured by the survey of professional forecasters. Using this alternate IV substantiates the baseline results.

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 con-

tains 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). According to the advocates of this framework, any expansion driven by expectational errors must eventually lead to a bust as fundamentals remain unaffected. 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.[3] 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 2 provides a description of the data and methodological approach used. In Section 3, 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 4. Section 5 explains the alternate IV constructed using professional forecasts. The final section concludes.

2 Data & 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

[3]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.

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.

2.1 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.[4] 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

[4]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.

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.

2.2 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 all major news events in the US for the sample of quarterly data starting from 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.[5] 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 behavior 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.

After conducting a rigorous set of checks, we therefore, include only non-economic news events that fulfil the criteria mentioned above for the purpose of instrument construction. 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.

After verifying the news items that can be used, we obtain information on sentiments drawn from public polls administered around the time of these events. Based on surveys and polling data containing information on both the positive and negative reported sentiments, we compute a *relative score* for each news item using the following:

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

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.[6] Based on this information, the relative score for this news item is calculated as: (6

[5]We use various online sources to identify news items. The year-by-year news and events published by Infoplease (`https://www.infoplease.com/yearbyyear`) provides a comprehensive list of news shocks.

[6]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.

- 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 4 by re-grouping *no opinion* responses to the majority opinion.

Similarly, an opinion poll following the announcement about voting age in June 1971 indicated that a small majority of 57% of US nationals supported the decision, yielding a relative score of (57 - 43)/100 = 0.14. 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, but a small relative score of (44 - 56)/100 = -0.12.

Figure 1 depicts the historical realizations of relative scores of consumer sentiment from January 1969 through May 2022. 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 0.86 based on a Gallup survey.[8]

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 con-

[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] A majority of opinion polls employed in this study are based on Gallup surveys. 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.

tain 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.

2.3 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).[9] This approach allows us to study how autonomous shifts in consumer sentiments 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 internal instrument method and local projection IV approach.

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), and consumer price index (CPI). That is, $X_t = [CC_t, Y_t, PCE_t, u_t, CPI_t]'$. 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:

$$e_t = Fv_t.$$

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

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 3 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 percentage 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 rate, and consumer price index. We also consider components of consumer spending, such as, private sector consumption of non-durables and durables, recreation spending and spending on services. In a subsequent analysis, we explore the impact of sentiment shock on interest rates and 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 4. 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).

2.4 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, 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 for a number of specifications in the top four 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 14.07. 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., 2021). The following three rows use monthly values of the instrument as the independent variable, while the dependent variables are alternative measures of consumer confidence shocks. In a majority of cases, the test statistics lend support to the relevance assumption of our instrument, which remains significant but inference may require weak-instrument robust approaches. 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.[10]

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. 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,

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

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 non-economic events are plausibly unrelated to economic factors.

3 Empirical results

3.1 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 and unemployment rate. The impulse responses represent the percentage change in each variable in response to one percentage increase in consumer confidence, along with the corresponding 68 and 90 percent 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 for a few quarters after the initial shock. The peak response of consumption spending takes place after roughly two years of the initial shock and is equal to 0.1 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 labor market. There is a persistently negative impact on unemployment rate due to an increase in consumer confidence, and unemployment rate remains below its pre-shock level for roughly three years. The largest reduction in unemployment takes place after eight quarters of the initial shock and is equal to approximately -0.05 percentage points. This period roughly coincides with the time consumer spending and output are at their peak response levels. On the monetary side, the second panel also reports the response of consumer price index to an increase in confidence. Initially the response is significant and negative, but it becomes insignificant within two quarters of the initial shock. 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 and the standard errors remain large. One possible explanation for the lack of a strong price increase comes from the monetary policy response discussed in the next section. Nonetheless, as described in Section

4, we do detect a positive 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 labor market conditions seem to be consistent with the notion that autonomous changes in consumer sentiment are related to 'demand shocks'. Nonetheless, the positive response of macroeconomic aggregates to a rise in consumer sentiment lasts for 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.

3.2 Components of consumption

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 in 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 non-durable consumption spending is smaller at approximately 0.02 percentage increase, and much larger for spending on services; a percentage increase in consumer confidence results in nearly 0.1 percentage increase in expenditure on services as opposed to 0.06 percentage 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. It is only the response of durable consumption spending that appears to fade away about two years after the sentimental shock.

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 a percentage increase in consumer sentiment brings about 0.4 percentage increase in durable goods recreational spending, and the response remains positive

and statistically significant for almost three years. The expansionary effect on recreational services spending remains significant over the entire duration of forecast horizon.

3.3 Other variables

We augment the baseline proxy-VAR by including additional variables of interest to examine their response to shifts in consumer sentiment. The second panel of Figure 4 reports the response of interest rate to a positive shock to sentiment. The interest rate shows a negligible effect on impact, and later starts to increase with a lag of one quarter. The maximum increase in interest rate takes place in the second quarter after the shock to consumer confidence, and is equal to 0.04 percentage points. It appears that the central bank may try to raise interest rate to offset the expansionary effects of consumer optimism about the state of the economy. 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 on interest rate adjustments is not statistically significant.

In the following step, we augment the vector of observables with the TFP series of Fernald and Wang (2016). The next graph in the second panel suggests a positive effect of a sentiment shock on utilization adjusted total factor productivity. A percentage increase in confidence results in 0.04 percentage rise in TFP, and the response remains positive over the duration of the forecast horizon. Although the impact becomes statistically insignificant in the short to medium term, a rise in sentiment does have an overall positive and significant longer-term effect on productivity. We return to this discussion in the next subsection.

Overall, we find that an autonomous increase in consumer confidence that we identify with an external instrument, sets off a persistent improvement in the state of the economy. Confidence shocks last for approximately eight quarters, and parallel with this, production, employment, and consumer spending rise gradually but persistently, and these responses are statistically significant. On the other hand, sentimental shocks have a short-lived effect on consumer prices and interest rates that mostly remain 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.

3.4 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 em-

phasizes 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).[11]

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.[12] 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 0.16 for the non-economic news shock series when 4 lags are used, and 0.23 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; TFP adjusted for utilization is unresponsive to the identified consumer sentiment shock. Figure 4 shows the TFP response to be insignificant at 90% level at some short to medium-term horizons.

4 Robustness Analysis

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)

[11] 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.

[12] 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.

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 also perform a placebo test where the non-zero instrument values are assigned to random dates.

As an additional test, we also derive dynamic causal effects using a local projection estimator 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 initial response of output and consumption is qualitatively very similar to the responses estimated through the proxy-VAR over first 2 years after the shock. However, the peak response of output, employment, and consumer spending takes place much later using the LP-IV method, with significantly larger magnitudes, compared to proxy-VAR estimates.[13]

4.1 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 favor 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.

The impulse responses presented in Figure 5 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 6 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

[13]These results are provided as supplementary material in an Online Appendix. Note that the confidence bands turn out to be wider in this case. This is because the LP-IV approach estimates parameters for each projection horizon.

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 labor market impact appears to be more pronounced with a 0.06 percentage point drop in unemployment rate upon impact.

4.2 Internal instrument approach

Next, we present our results using an internal instrument approach by estimating a recursive VAR with the instrument ordered first. Plagborg-Møller and Wolf (2021) document that the relative impulse responses obtained from this approach are immune to measurement error in the instrument. To estimate a recursively identified structural VAR (SVAR), we include the same endogenous variables as before, along with the non-economic news events relative score series which is ordered first in the system. The initial response of the sentiment shock series is normalized to 1. The corresponding impulse response functions are presented in Figure 7.

We find that the estimates obtained generally follow a very similar pattern to the proxy-VAR model. Nevertheless, the response becomes statistically insignificant much sooner compared to baseline results. Although the expansionary labor market impact is stronger in this case, with a 0.1 percentage point decline in unemployment rate, the response becomes insignificant within three quarters of the initial impact. Furthermore, the peak response of output and consumption spending takes place much later, and roughly three years after the initial shock. Overall, the results derived from the internal instrument approach qualitatively align with the proxy-VAR model explained earlier.

4.3 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. 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 and consumption. However, there are some stark 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 0.025 percentage point significant decline in unemployment rate two years after the shock. The impact fades away within three years. On the monetary side, interestingly, the response of consumer price index is positive and significant, in contrast to the original findings based on quarterly data. Although the effect becomes insignificant within four months of the initial shock, the immediate impact is consistent with the prior expectation of an inflationary effect of a positive shock to consumer confidence.

4.4 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 analyzed 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).[14] 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.

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

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

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 carry out an additional robustness test by excluding these events from our analysis. The estimates generated are consistent with the ones obtained by using all observations, including news about various national and global occurrences of war.

4.5 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.

5 Alternate IV: Unanticipated economic news

In this paper, we have used an external instrument for autonomous fluctuations in survey evidence on household expectations about the future outlook of the economy. We use an IV that has an impact on consumer confidence but reflects news about events that are arguably unrelated to economic fundamentals. Business cycle fluctuations may derive from many different sources and the existing work in macroeconomic theory has also considered the possibility that these movements may originate from other sources related to expectations of economic agents. In this section, we construct an alternative instrument to address the challenge associated with quantifying sources of fluctuations from observational data. To identify the dynamic causal impact of sentimental shocks to the US economy, we attempt to extract an autonomous component from consumer confidence data based on unanticipated economic news shocks. The idea is that while consumer confidence data may reflect households' views on the economy, it may also be suggestive of sentiments derived due to 'surprises', or unexpected economic shocks. An unanticipated economic news shock may,

thus, serve as an instrument that has a significant impact on sentiment, but is arguably unrelated to economic fundamentals.

This approach builds on survey evidence on professional expectations about the future outlook of the economy, and uses predicted values of macroeconomic aggregates. In particular, the unanticipated economic news shock, X_t^{Shock}, is defined as:

$$X_t^{Shock} = X_{t-1}^{Actual} - X_{t-1}^{Pred} \tag{3}$$

where X is the economic variable of interest, X_{t-1}^{Actual} is the actual value of X in the previous period that gets known in the current period, and X_{t-1}^{Pred} is the predicted value of X in the previous period. We consider two variables: GDP and inflation rate in this exercise.[15] The predicted values of macroeconomic variables are obtained from the Survey of Professional Forecasters.

In Table 5, we provide evidence of the link between unanticipated economic news shocks and consumer sentiment, which can serve as a potential channel through which the instrument may have an impact on survey evidence related to consumer confidence. It reports the first-stage F-statistic and p-value for the null hypothesis that the instrument has no explanatory power for consumer confidence. The dependent variable is growth in consumer confidence index, and the dependent variables are unanticipated changes in output and inflation. The F-statistic is equal to 16.7, which shows that the IV satisfies the relevance condition. In other words, consumer confidence is correlated with the unexpected economic news shocks, or the prediction error in forecasting key macroeconomic indicators.

Figure 11 illustrates the corresponding impulse response functions for a proxy-VAR estimation using the alternative IV. Standard errors are calculated once again using recursive wild bootstrap method, and we present 68 and 90 percent confidence intervals. To compare the estimates obtained using the two instruments, we also exhibit the baseline IRFs in Figure 11 (denoted by red dashed lines). The first graph indicates that a positive unanticipated news shock (for instance, when the actual value of GDP turns out to be higher than its predicted value, as defined in Eq. 3) results in a significant boost in consumer confidence. This effect remains statistically significant for about a year and a half,[16] and fades away over the forecast horizon.

We find that, in line with the results obtained previously, an autonomous rise in consumer sentiment sets off a persistent expansion in the state of the economy. Production and consumption surge, with the maximum rise occurring upon impact which is significant at 90% level. The positive immediate and subsequent impact is also true for employment level, and mirroring the response of output and consumption, the magnitudes of these effects are much

[15] Ramey (2011) used a similar approach in the context of government spending shocks.

[16] This is much sooner than the impact of the shock based on the original IV constructed using non-economic news shocks.

larger compared to the baseline IV. There is a 0.1 percentage point decline in unemployment when we use the unanticipated economic news shocks as IV, as opposed to less than 0.05 percentage point drop derived from sentiment shocks based on major non-economic news events. On the other hand, although the initial impact on output and consumer spending is bigger and very persistent, the overall effect fades away much sooner compared to a relatively long lasting impact generated from the original IV. Interestingly, the positive consumer sentiment shock leads to an increase in consumer prices, and the effect remains significant for over a year. This result aligns with a surge in economic activity fuelled by optimistic beliefs about the state of the economy as the actual output becomes known to be greater than the GDP forecasts produced by professionals.

6 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 behavioral 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 sug-

gesting 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 over the announced 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 analyze 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 TFP. 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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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
Exports	BEA Table: 1.1.3
Imports	BEA Table: 1.1.3
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)
Predicted Real GDP and Inflation[4]	Survey of Professional Forecasters
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. We extrapolate it backwards from 1985 by using the growth rates of the historical news based uncertainty index.

[4] The shock value is calculated as $\ln(k(X_1/X_2))$, where X_1 is the actual value of the variable for the previous quarter, and X_2 is the predicted value of the variable for the previous quarter. k is a constant that is included to take into account occasional revisions in values of variables that are calculated from real time vintage data. Price Index for GDP is used as a measure of inflation shock since data on CPI does not go back to 1969.

Table 2. Instrument strength

Dependent	Independent	Test Type	Test Statistic	p-value
CC Growth	News	Linear	12.62 (F)	0.00
CC Growth	News (monthly)	Linear	5.45 (F)	0.02
CC - CC(-2)	News (monthly)	Linear	12.89 (F)	0.00
CC - CC(-6)	News (monthly)	Linear	8.30 (F)	0.00
News	dy, dpce, du, dr, dcpi	Granger	16.38 (χ^2)	0.69
News Dummy	dy, dpce, du, dr, dcpi	Probit	16.00 (χ^2)	0.72

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)	6.55 (χ^2)	0.16
TFP	News Instrument	Granger (8 lags)	10.51 (χ^2)	0.23

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	15.88 (F)	0.00
CC Growth	News Dummy	Linear	16.38 (F)	0.00

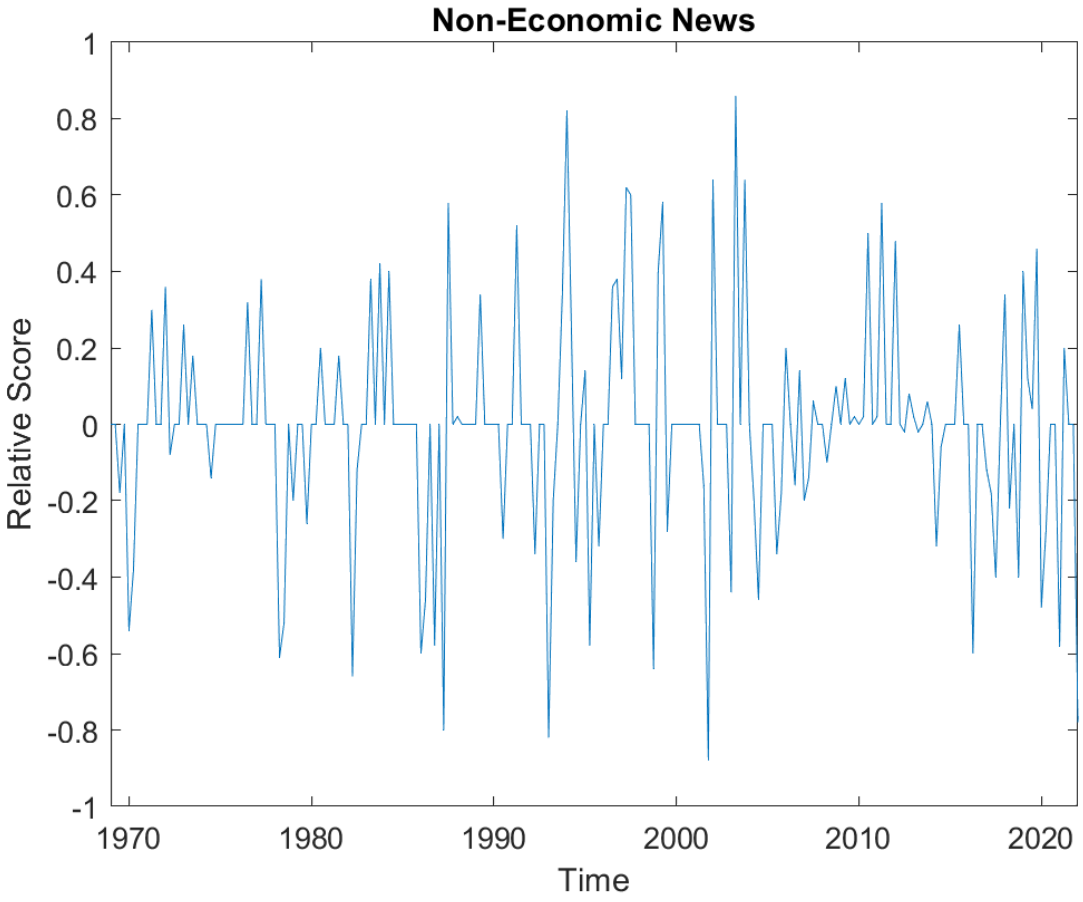
Note: The table reports test statistics based on alternative measures of non-economic news shocks instruments. The top row presents estimation results of F-tests for the null hypothesis that the alternate instrument coefficient is zero in the first stage regression for consumer confidence. The second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

Table 5. Unanticipated economic news

Dependent	Independent	Test Type	Test Statistic	p-value
CC Growth	Y, inflation error	Linear	16.70 (F)	0.00

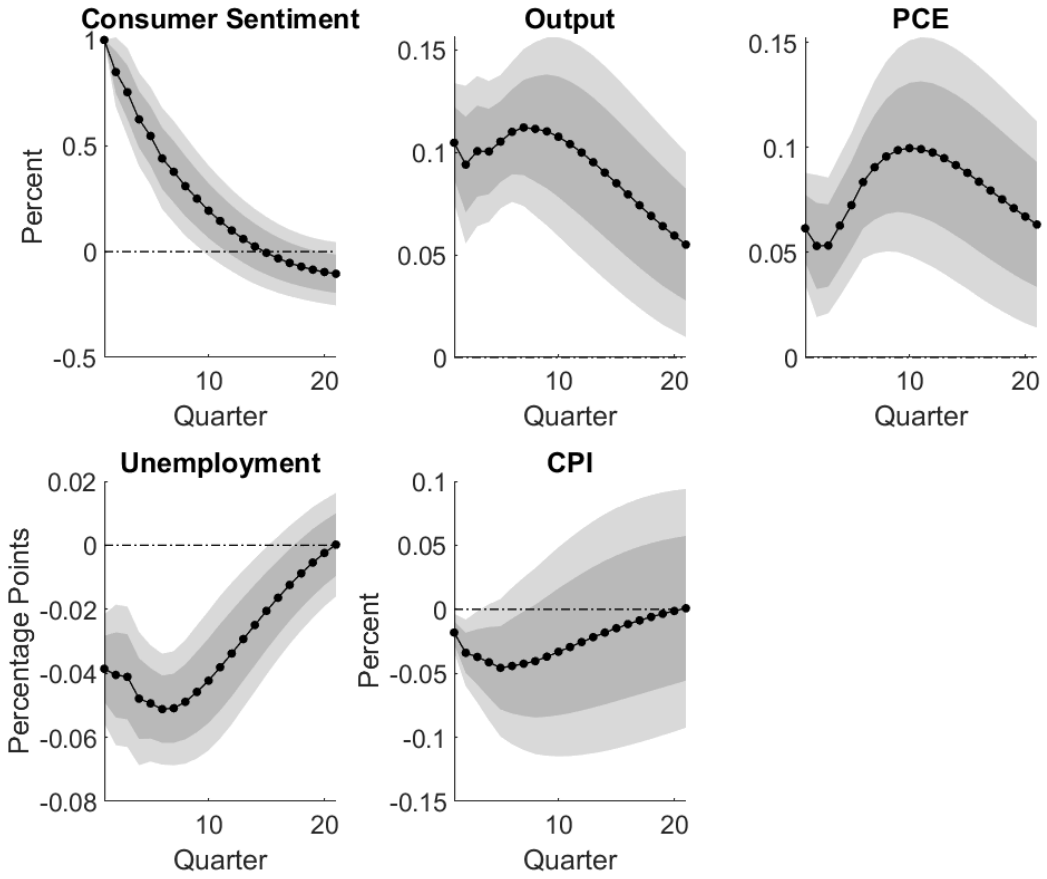
Note: The table reports test statistics for the alternative instrument, unanticipated economic news. It presents test statistics for consumer confidence growth regressed on unanticipated output and price shocks.

Figure 1. Non-Economic news shocks: Relative scores



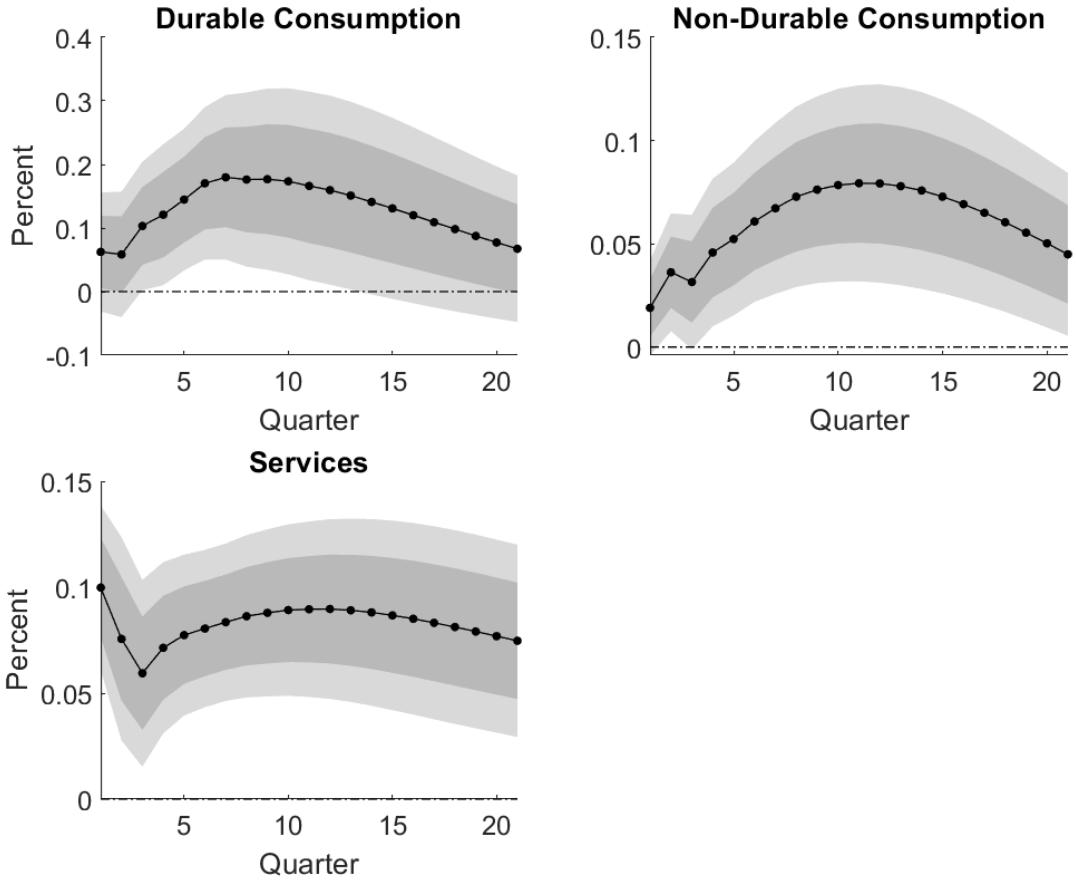
Note: The figure shows relative scores for non-economic news shocks from 1969:1 to 2022:4 (quarterly data) based on Eq. 1 computed using: Relative score = (Positive response - Negative response)/100.

Figure 2. Effect of consumer sentiment shocks



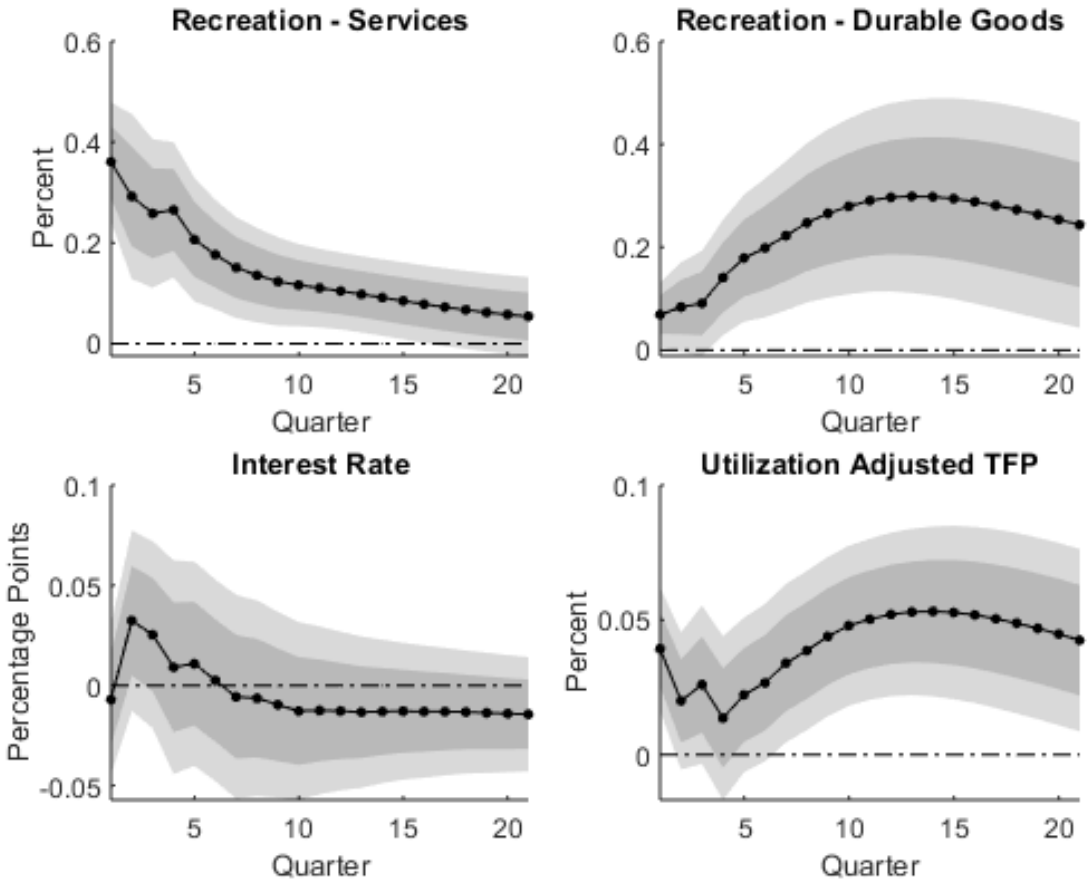
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method. We include log consumer confidence, log output, log consumption spending, consumer price index, and unemployment rate in the baseline estimation. Consumer confidence shocks are identified by using 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



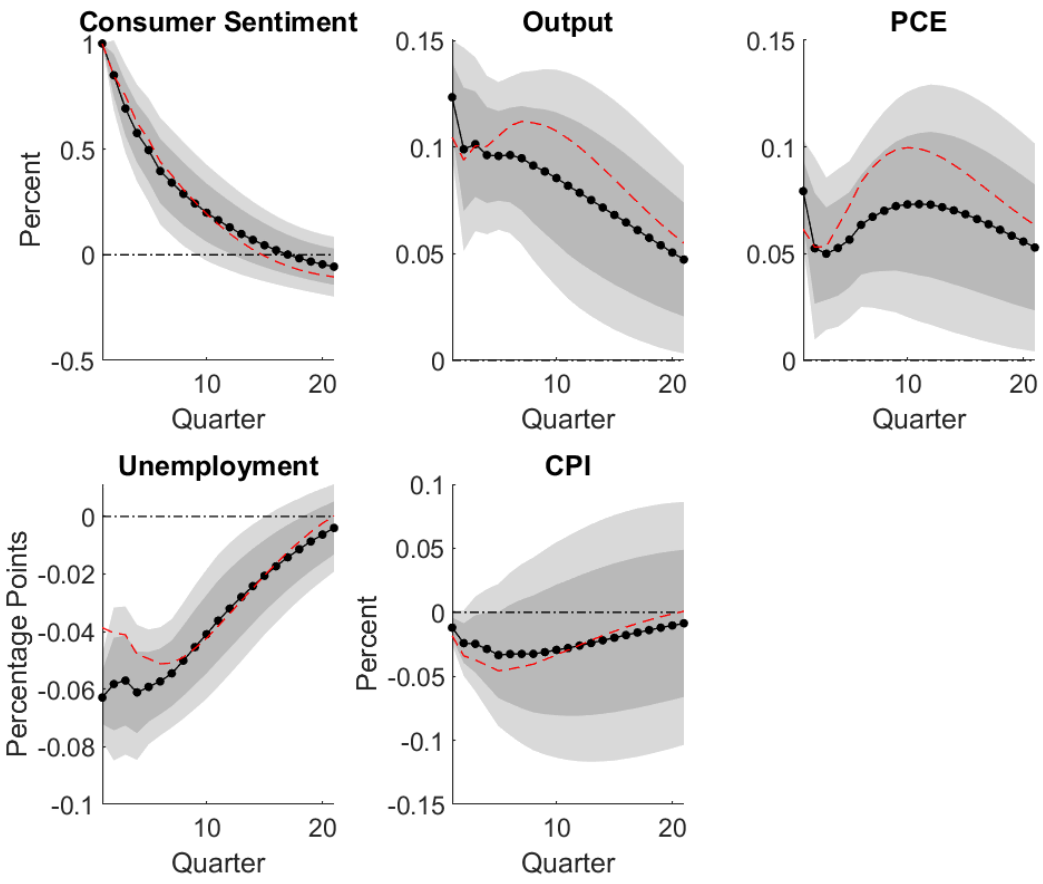
Note: The figure presents the effects of consumer confidence shocks on components of consumer spending (durables, non-durables, and services) estimated using the proxy-VAR method. We include log consumer confidence, log output, log consumption, consumer price index, and unemployment rate in the estimation. 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 macroeconomic variables



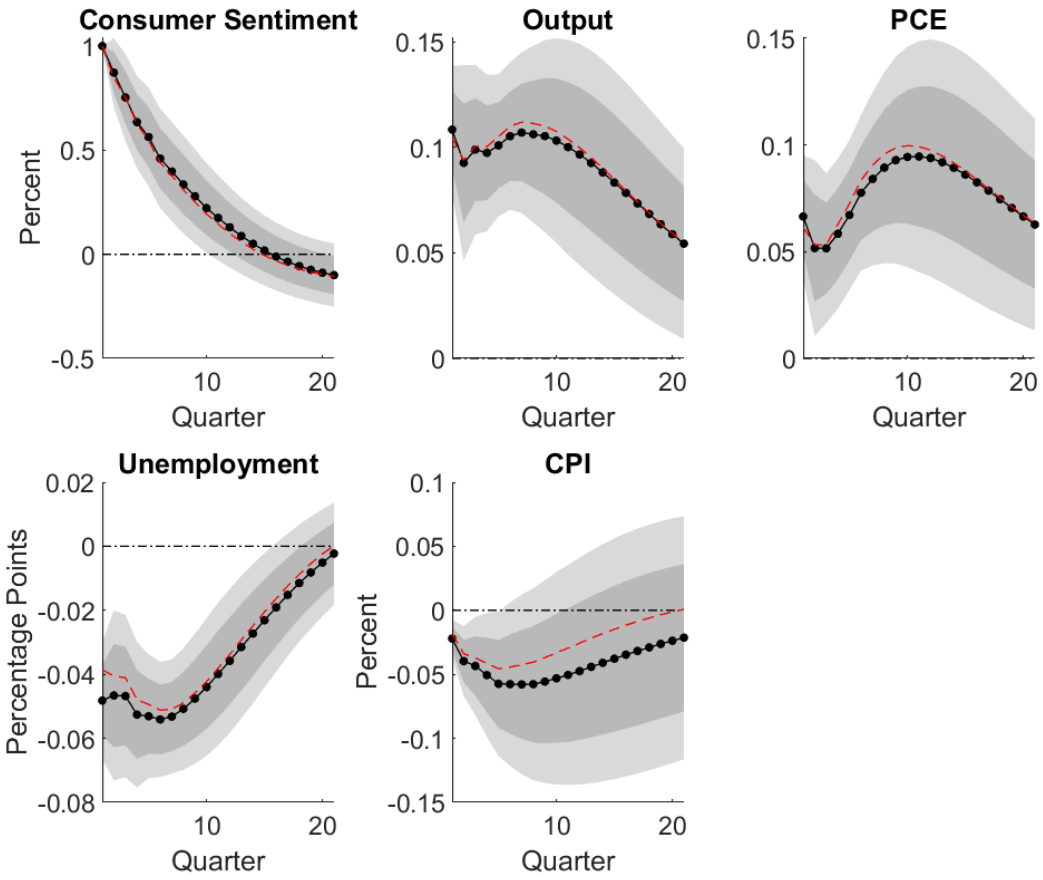
Note: The figure presents the effects of consumer confidence shocks on components of consumer spending (recreation - durable goods and services), interest rate, and utilization adjusted TFP, estimated using the proxy-VAR method. We include log consumer confidence, log output, log consumption, consumer price index, 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. Measurement error: Alternative dates



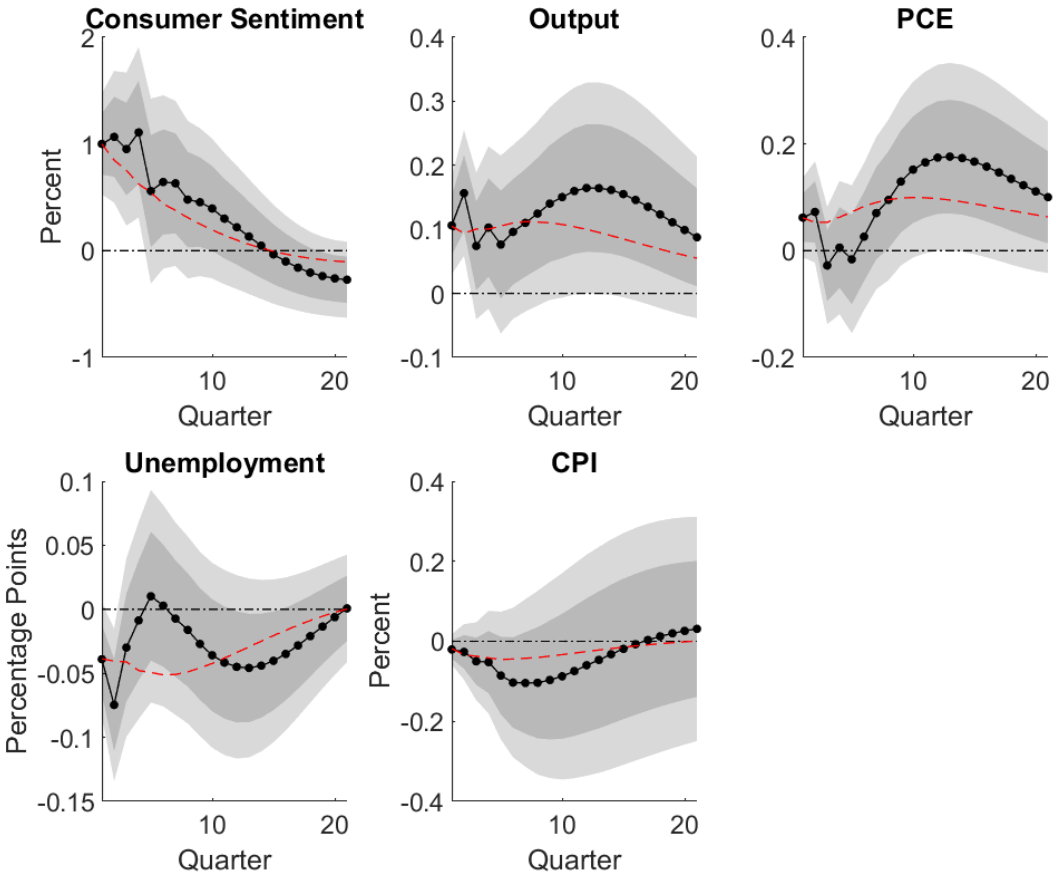
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method based on alternative grouping of non-economic news events in the quarterly data, 1969:1-2022:4. We include log consumer confidence, log output, log consumption spending, consumer price index, and 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 6. News dummy



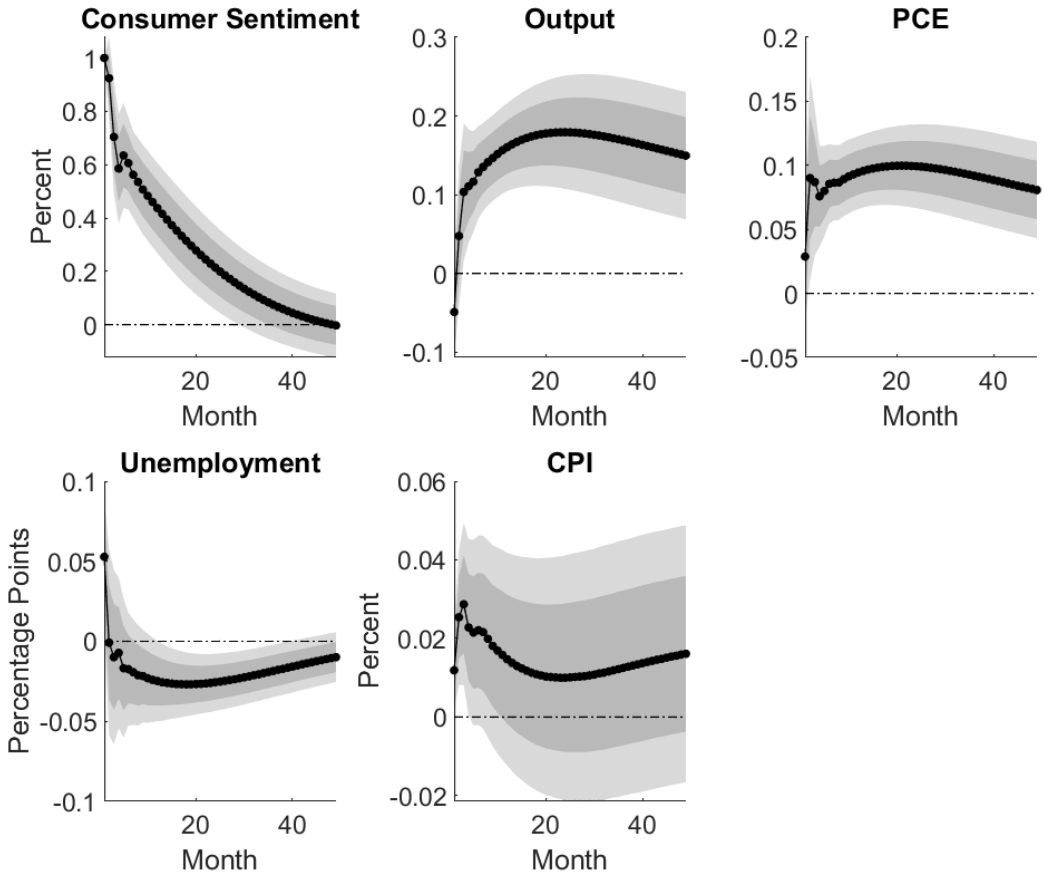
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method based on news dummy variables for the quarterly data, 1969:1-2022:4. We include log consumer confidence, log output, log consumption spending, consumer price index, and unemployment rate in the estimation. 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. Measurement error: Internal instrument approach



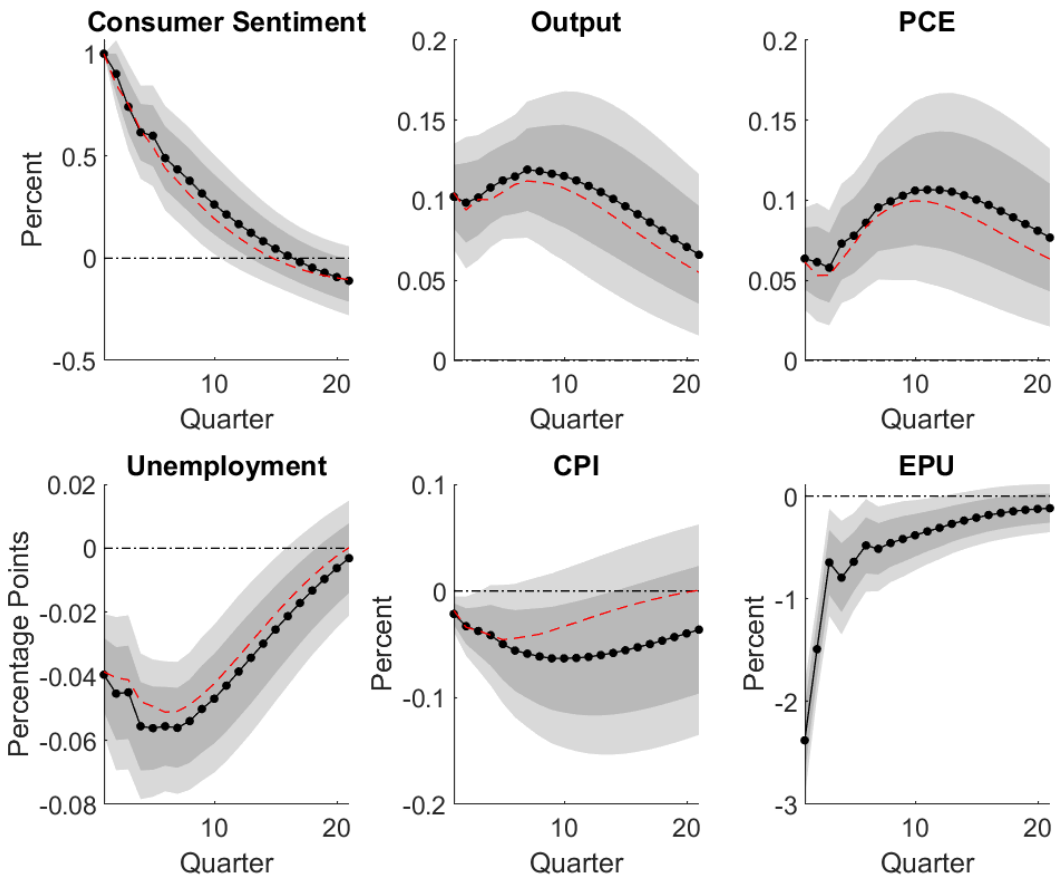
Note: The figure presents the effects of consumer confidence shocks estimated using the internal instrument approach for the quarterly data, 1969:1-2022:4. The model includes the news shocks relative score series ordered first in a recursive VAR, which also includes log consumer confidence, log output, log consumption spending, consumer price index, and unemployment rate in the estimation. 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



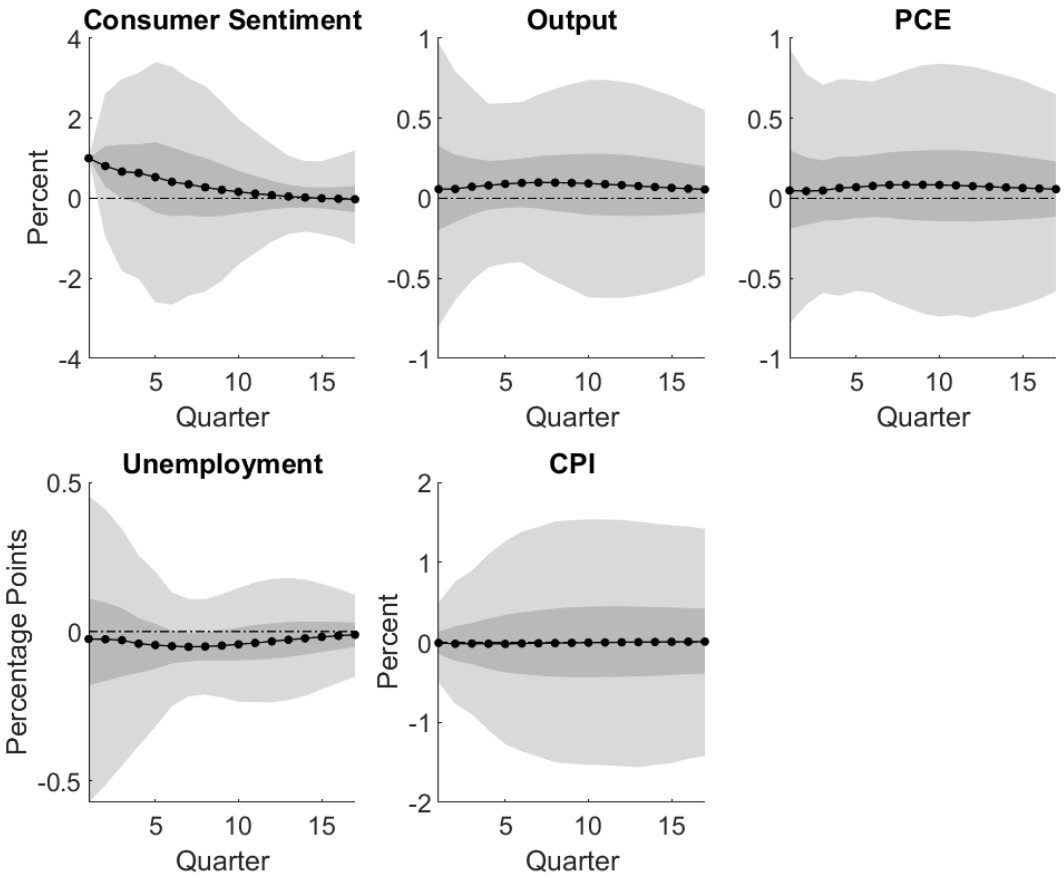
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method for monthly data, 1969:1-2022:12. We include log consumer confidence, log output, log consumption spending, consumer price index, and unemployment rate in the estimation. Consumer confidence shocks 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



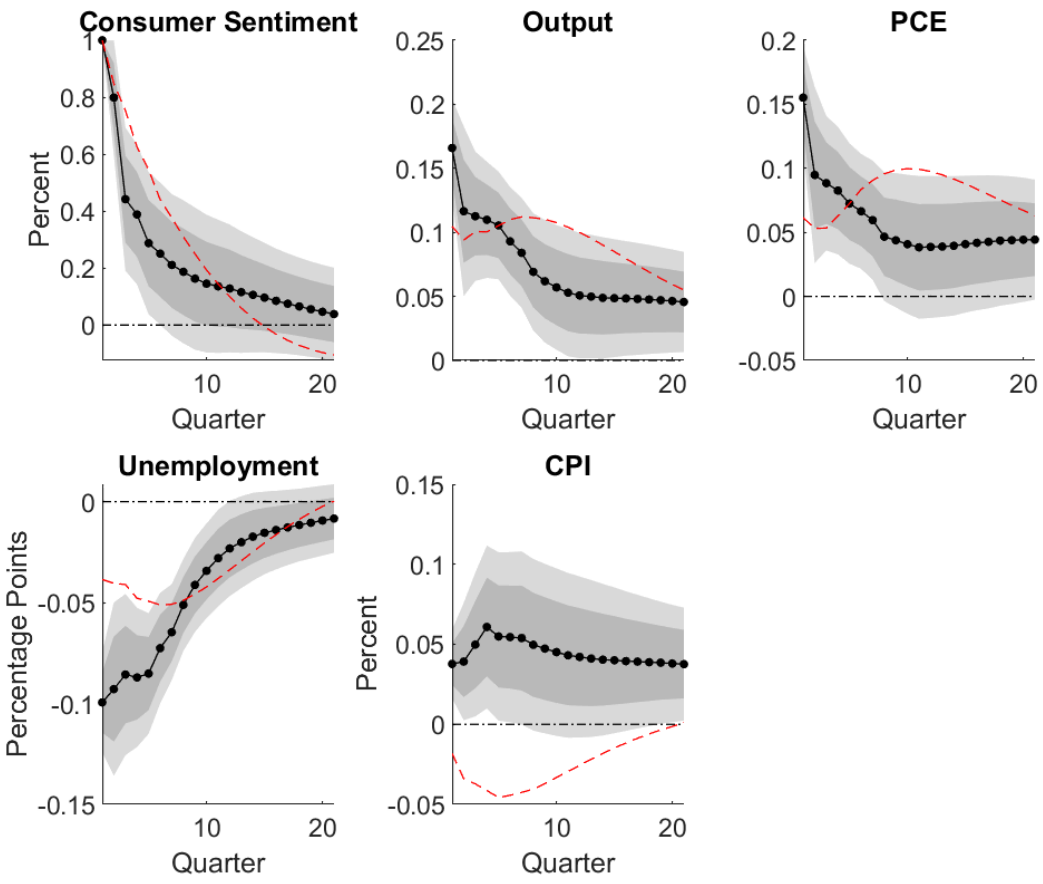
Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method for quarterly data, 1969:1-2022:4, after controlling for economic news. We include Economic Policy Uncertainty index, log consumer confidence, log output, log consumption spending, consumer price index, 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, 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.

Figure 11. Unanticipated economic news



Note: The figure presents the effects of consumer confidence shocks estimated using the proxy-VAR method for quarterly data, 1969:1-2022:4, based on an alternate instrument. Consumer confidence shocks are identified by using the series of unanticipated economic news shocks as a proxy or instrumental variable. We include log consumer confidence, log output, log consumption spending, consumer price index, and unemployment rate in the estimation. 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.