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Bad News, Good News: Coverage and Response Asymmetries

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Bad News, Good News: Coverage and Response Asymmetries*

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Abstract

We study the dynamic link between economic news coverage and the macroeconomy. We construct two measures of media coverage of bad and good unemployment figures based on three major US newspapers. Using nonlinear time series techniques, we document three facts: (i) there is no significant negativity bias in economic news coverage. Newspapers' asymmetric responsiveness to positive and negative unemployment shocks is entirely explained by their asymmetric effects on unemployment; (ii) consumption reacts to bad news, but not to good news; (iii) bad news is more informative to the agents and modifies their expectations more than good news.

JEL classification: C32, E32.

Keywords: News Coverage, Agents' Information, Business Cycles, Asymmetry, Threshold-SVAR.

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1 Introduction

Expectations about current and future economic conditions are at the root of agents' decision-making process and are an important source of business cycle fluctuations. Under the full-information rational expectations paradigm, agents form expectations and take decisions with perfect knowledge of the economy. In practice, agents' information may differ substantially from the comprehensive representation of the economy assumed by the theory.[1] Agents acquire signals through a variety of channels which mediate the informational content available to them. News media represent one of these channels and a major source of economic information (see Blinder and Krueger (2004)). This establishes a potentially important link between economic news coverage, agents' information and expectations, and macroeconomic dynamics.

This paper empirically investigates this link with a specific focus on the qualitative content of economic news. In particular, we test for two potential asymmetries in the way in which newspapers and agents, respectively, respond to positive and negative economic information. First, we investigate if there is a negativity bias in economic news coverage. Such bias implies that media cover negative economic events more than positive ones (see Soroka (2006)). A higher number of negative news during bad times and a subdued amount of positive news in good times influence agents' information accordingly and may result in overpessimistic and underoptimistic views during recessions and expansions. The second asymmetry is related to agents' response to bad and good news. Agents may attach, everything else equal, higher informational value to negative than to positive economic news and revise their expectations and consumption decisions differently depending on the type of news they receive.[2] In this case, agents would react asymmetrically to good and bad news with clear implications for economic outcomes. We test both asymmeteries within a unified econometric framework.

We begin by constructing two novel measures of media coverage of bad and good economic events using three major US newspapers.[3] Our measures of bad and good news represent the total number of articles each month reporting increases or high values of unemployment

[1] See, among others, Mankiw and Reis (2002), Sims (2003) and Woodford (2002).

[2] Such asymmetry can arise, for instance, when agents are more concerned about their income losses than about their gains, as for example in theoretical models with loss aversion (see Kahneman (1979)) or with risk averse and rational inattentive agents (see Tutino (2013)).

[3] Textual analysis has become a powerful tool not only for macroeconomic analysis as it is used here, but also for forecasting. For instance, Larsen and Thorsrud (2019) shows that many news topics are good predictors of economic variables in Norway. Mueller and Rauh (2018) builds a large dataset of news to construct an indicator for predicting armed conflicts.

and decreases or low values of unemployment, respectively. We focus our attention on unemployment since this variable is a major cyclical indicator and is central to the economic news selection process (see Fogarty (2005)). We compare our bad and good news measures with their counterparts obtained from the Michigan Survey of Consumers: the portion of respondents reporting they recently heard bad and good news about unemployment and employment, respectively. We find that both our measures strongly correlate with their counterparts from the survey. The importance of this finding is twofold. On the one hand, it validates our indicators by proving their consistency with respect to other measures of information about unemployment. On the other hand, it suggests that newspaper information is relevant to the agents and could thus represent an important element in shaping their expectations and decisions. We use our news measures to build two standard indicators of information: *negativity*, obtained as the difference between the number of bad news and good news, and *total information*, obtained as the sum of the two. The former represents the prevailing (negative) tone of news about unemployment, while the latter its overall coverage. Both our indicators are highly correlated with the unemployment rate.

We then use a Threshold Structural Vector Autoregression (TSVAR) model to assess the dynamic link between media coverage of the economy and agents' consumption, information and expectations. This dynamic, multivariate model allows us to address potential endogeneity issues and account for much richer (non-linear) dynamics when compared to simple linear regressions. First, we use such framework to study the dynamic response of *negativity* and *total information* to positive and negative unexpected changes in the unemployment rate, and thus assess if there is any asymmetry in the news reporting process of the economy. Second, we use the model to study the dynamic responses of agents' consumption, information and expectations to bad and good news shocks, as measured by positive and negative unexpected changes in negativity. The methodological novelty of our approach is to allow for asymmetries in the impulse response functions based on the sign of the shock considered.

Our first contribution is to show that there is no negativity bias in economic news coverage once we allow for asymmetries in the dynamics of the economy. A bad economic shock which unexpectedly increases the unemployment rate generates a larger and more persistent effect on *negativity* than a good shock. This is in line with previous evidence from the political science literature which points towards the existence of a negativity bias in media coverage of economic events, as measured by changes in the unemployment rate (see e.g. Soroka (2006) and Soroka (2012)). However, the shock has also a substantial nonlinear effect on the unemployment rate: a bad shock generates larger and more persistent effects than a good

shock. If the effects on negativity are normalized by the effects on the unemployment rate, asymmetries in media coverage vanish. Indeed, the response of negativity becomes extremely similar for negative and positive shocks. This result represents evidence against the existence of a negativity bias in media coverage of the economy. The same finding is obtained for *total information*. We conclude that the negativity bias previously found in the literature is attributable to asymmetries in the dynamics of unemployment.

Our second contribution is to document a significant asymmetry in the agents' response to bad and good news shocks. A bad news shock which unexpectedly increases negativity decreases consumption substantially, especially of durable goods, while a good news shock has essentially no significant effect. To better understand this result, we estimate the responses of agents' information and expectations to the two shocks and find that these are consistent with the responses of aggregate consumption. The fraction of informed individuals from the Michigan Survey increases (reduces) in response to a positive (negative) shock to negativity. Moreover, agents agree more about economic outcomes and change their expectations more markedly facing an increase in the negativity than a reduction. These results point to a substantially higher information content of bad news compared with good news and suggest a rationale for the stronger response of aggregate consumption to bad news. Our findings are robust to several changes in the model specification and, in particular, to the exclusion of the Great Recession, which represents an unprecedented period of bad news reporting about the economy.

Based on these results, we draw an interesting conclusion. While there is no significant negativity bias in economic news reporting, there exists a significant bias in the way agents weight the qualitative content of economic news when they form expectations and take consumption decisions. To the best of our knowledge, we are the first to provide this evidence. The asymmetric behaviour of expectations and consumption that we document in this paper cannot be explained by a higher number of negative news relative to positive news (for which we control here) and thus is at odds with both the standard Permanent Income Hypothesis and models of *sticky expectations* (Carroll (2003)). On the contrary, the type of asymmetry we document suggests that, given an equal number of good and bad news items, agents give greater weight to negative rather than positive economic information.

Media coverage of economic events has been studied, to some extent, in the economics literature (see Mullainathan and Shleifer (2005) and Nimark and Pitschner (2019)), but the bulk of contributions comes from the political science literature. The key finding in this field is the existence of a negativity bias in economic news reporting: negative events receive higher

media attention than positive events, see Goidel and Langley (1995), Fogarty (2005), Soroka (2006) and Soroka (2012). This is typically shown in the context of simple linear regressions where the tone of unemployment news is regressed on positive and negative changes in the unemployment rate, together with an additional set of controls.[4] We document the absence of any bias in news reporting once the effects of economic shocks on economic variables are explicitly taken into account. News coverage reacts significantly and very similarly, both qualitatively and in terms of magnitudes, to positive and negative economic shocks.

Our paper also closely relates to a vast literature studying how news affects macroeconomic outcomes. News shocks to productivity have been documented to be an important driver of the business cycle.[5] With respect to this literature, we make three main contributions. First, we do not limit our attention to news about technology, but rather consider general news about future unemployment developments. Second, we use a measure of news constructed from newspaper articles rather than relying on a theory-based identification.[6] Third, and most importantly, we allow bad and good news to have asymmetric effects on the economy.

Several studies have focused on the link between the media and consumers' expectations, see for instance Larsen et al. (2020). Empirical evidence suggests that agents update their expectations more frequently during periods of high news coverage, typically during recessions, see Doms and Morin (2004) and Carroll (2003). Also, bad news is found to have larger effects than positive news on consumers' opinion and confidence, see Soroka (2006) and Soroka (2014) for a review. Our results largely confirm this finding. With respect to this literature, we make two main contributions. First, we use a dynamic, multivariate model which, with respect to simple regressions, addresses potential endogeneity issues and is able to account for nonlinear dynamics. Second, we study the role of bad and good news for the expectation formation process by focusing on agents' information and its implications for consumption.

The remainder of the paper is organized as follows. Section 2 describes our measures of bad and good news and their relation to the unemployment rate and measures of news from the *Michigan Survey of Consumers*. Section 3 discusses the extent of news coverage

[4] An exception is Casey and Owen (2013). In this paper, the opposite conclusion is reached: news significantly respond to positive forecast of GDP growth but not to negative forecast, a sort of positivity bias.

[5] A partial list of contributions includes Beaudry and Portier (2004), Beaudry and Portier (2006), Cochrane (1994), Den Haan and Kaltenbrunner (2009), Forni et al. (2017), Jaimovich and Rebelo (2009), Barsky and Sims (2011), Schmitt-Grohé and Uribe (2012)), Barsky and Sims (2012).

[6] In this respect, our work is closely related to Larsen and Thorsrud (2019) and Chahrour et al. (2021), which use textual information from newspapers to identify the news shock.

of economic events. Section 4 presents how agents' information, agents' expectations and agents' consumption respond to bad and good news. Section 5 discusses the robustness of our main findings. Section 6 concludes.

2 The U-news indexes

This section describes the construction of our news variables and discusses their time series properties.

2.1 Constructing the indexes

We construct two novel measures of newspaper coverage of bad and good unemployment figures, which we refer to as the U-news$^+$ index and the U-news$^-$ index, respectively. For this purpose, we use Dow Jones Factiva, a comprehensive database of news articles, and focus our analysis to three major newspapers in the United States for the period from June 1980 to December 2019: *The New York Times*, *The Wall Street Journal* and *The Washington Post*. The choice of the three outlets is motivated by the fact that they have consistently appeared among the largest US newspapers by circulation during the period of interest and all aim for national audiences. We focus our attention on articles about the unemployment rate since this variable represents a major cyclical indicator and its fluctuations are closely monitored by the news media (see Fogarty (2005)).

We construct the time series of bad news, U-news$^+$, by counting the number of articles each month in which the word "unemployment" appears near to another word denoting an increase or high level. Similarly, for the good news variable, U-news$^-$, we count the number of articles in which the word "unemployment" appears close to words denoting a decrease or low level.[7] We then clean these two measures by subtracting from each of them the number of articles which are selected under both *good* and *bad* criteria. Thus, we explicitly exclude those articles (approximately 6% of the total sample) that cannot unambiguously be classified in one of the two categories. We acknowledge the fact that this class of news can also be of some interest, since this news may convey information about periods of relatively stable

[7]The index is similar in spirit to the R-Word index constructed by The Economist and to the media coverage series used in the seminal paper Soroka (2006). The difference with the R-Word index is that our search is based on the word unemployment and differentiates between positive and negative news. A detailed explanation of the search queries is included in the Online Appendix. Notice that our news variable is not a sentiment-based indicator. We believe it would be interesting to try to construct such an indicator and study potential differences with ours. We plan to do this in the future.

unemployment or reflect mixed signals about the labor market. However, for the purpose of the present study, which is concerned with potentially asymmetric effects of good and bad news, it is of primary importance to have a clear measure of news polarization.[8] The final dataset includes a total of 35933 bad news items and 22317 good news items over the period considered.

Using the two raw indexes, we construct two additional variables. The first, which we call *negativity*, is the difference between the two indexes of bad and good news: U-tone = U-news^{+} − U-news^{-}. If U-tone is positive, newspaper coverage of unemployment figures is prevailingly negative, and vice-versa. The variable is expected to be positively correlated with the unemployment rate and its average depends on the averages of good and bad news. The second variable is a measure of *total information* and it is defined as the sum of good and bad news: U-total = U-news^{+} + U-news^{-}.

2.2 Descriptives

In the left-hand column of Figure 1 we report our two news indexes (blue lines) together with the unemployment rate (red lines). The averages of bad and good news are, respectively, 76 and 47 articles per month, and the standard deviations are 46 and 20. News reporting of bad unemployment figures is, on average, higher and more volatile than the reporting of good unemployment figures. The most striking difference between the two indexes, however, is in terms of the correlation with the unemployment rate: 0.78 for bad news and -0.28 for good news. This is also clear from a simple visual inspection of the pattern of co-movement of the two indexes with the unemployment rate. The measure of bad news, U-news^{+}, tracks the unemployment rate extremely closely, with two major spikes of similar magnitude in correspondence of the early 1980s recession and the Great Recession. On the contrary, and quite surprisingly, the measure of good news, U-news^{-}, seems largely unrelated to the unemployment rate, except in three episodes: the end of the 1980s, the end of the 1990s and after 2015. The news reporting of negative economic events appears substantially more cyclical than the coverage of positive economic events.

We report the U-tone index in the bottom right-hand panel of Figure 1. As expected, negativity has a high correlation with the unemployment rate (0.79). The average negativity is 29 and statistically different from zero. An interesting feature of the U-tone index is that it leads the unemployment rate: negativity tends to anticipate both increases and decreases

[8] The results presented below are robust to the inclusion of this ambiguous news. The reason is that this set of news is relatively small over the sample considered.

in the unemployment rate. This suggests that the articles we consider have informational content not only about the current, but also prospective developments in the unemployment rate. The top right-hand panel of Figure 1 reports the U-total index together with the unemployment rate. The information content is countercyclical, with a correlation of 0.64 with the unemployment rate. This result could be seen as *prima facie* evidence supporting a larger degree of news coverage of bad economic events than good events. We explore the issue more formally in the next section.

A potential concern related to the construction of the news indexes could be that the three newspapers considered may cover unemployment developments differently, depending on their political view. Figure 9 in the Online Appendix reports our news indexes disaggregated by newspaper. Overall, the coverage of both bad and good unemployment developments is remarkably consistent across different newspapers. Indeed, all of the indexes track each other very well over the sample period. The finding rules out the existence of a relevant political bias in the unemployment news reporting for the newspapers considered.

A possible reason for the absence of a relevant negative correlation between good news and the unemployment rate might be the fact that positive news refers to increases in employment rather than decreases in unemployment. In Online Appendix A.2 we discuss the construction of an alternative measure of good news, the E-news$^+$ index, based on the word "employment". In a similar way to the other two measures, we select articles in which the word "employment" appears within a specified distance of another word denoting an increase or high level. We report this alternative measure together with the unemployment rate and with the U-news$^-$ index in Figure 10 in the Online Appendix. The correlation among U-news$^-$ and E-news$^+$ is 0.14, while the correlation of E-news$^+$ and unemployment is even positive (0.28). This suggests that the unemployment-based measure is more reliable and that its small negative correlation is not the result of a poor search strategy.

2.3 U-news indexes and consumer survey information

At first glance, the relatively small procyclicality of the U-news$^-$ index might be puzzling, since *a priori* it would be reasonable to expect a pattern close to the reverse of the U-news$^+$ index. In what follows, we compare our news indexes with other measures of news taken from the *Michigan Survey of Consumers* in order to assess the consistency of our measures with the information of the agents from the survey.

The survey provides a wide variety of variables that reflect agents' information and expectations about the current and future state of the economy. The variable NEWS in the

survey corresponds to the percentage of individuals who recently heard of any favorable or unfavorable changes in business conditions. Question A6 of the questionnaire asks the following: *"During the last few months, have you heard of any favorable or unfavorable changes in business conditions?"*. There are two possible answers: *"Yes"* and *"No, haven't heard"*. If the individual answers *"Yes"*, then the second question is A6a: *"What did you hear?"*, which is an open-ended question. The Michigan Survey provides few variables constructed on the basis of the type of answer to these two questions. Among those, we focus on the following variables: "No News", which is the percentage of respondents choosing the corresponding option in question A6; "Favorable" and "Unfavorable", which correspond to the percentage answering positively and negatively to question A6a; and "Favorable: employment" and "Unfavorable: unemployment", corresponding to answers to question A6a which are specifically related to positive and negative evaluations of, respectively, employment and unemployment figures.

While our indicators of bad and good news represent *objective* measures of the amount of negative and positive published news items related to unemployment figures, the corresponding two variables from the Michigan Survey represent the *subjective* information that the agents perceive from the media or alternative sources of information. In principle, agents' *subjective* information may not coincide with our measures of *objective* information. For example, agents may mostly get informed through other channels (TV, social networks, etc.) or they may be *rational inattentive* even in information-rich environments (see Sims (2003), Nimark and Sundaresan (2019)).

The first column of Figure 2 illustrates our U-news$^+$ and U-news$^-$ indexes together with the corresponding measures in the *Michigan Survey of Consumers*, namely the "Unfavorable: unemployment" and "Favorable: employment" items of NEWS. We uncover an interesting finding: both indexes track the corresponding variables of the Michigan Survey extremely closely over the sample considered. The correlation between "Unfavorable: unemployment" and U-news$^+$ is 0.68, and the correlation between "Favorable: employment" and U-news$^-$ is 0.46. Overall, our indexes and the survey measures are remarkably consistent with each other. This suggests that newspaper information is a relevant channel for agents' information. It could thus be important for shaping agents' expectations and decisions. The second column of Figure 2 reports our measures of negativity and total information together with their counterparts constructed using the variables of the Michigan survey. As far as total information is concerned, the correlation between the two variables is 0.61, while the correlation is 0.65 for negativity. This again confirms the consistency between our newspaper

measures and the survey measures.

3 Asymmetric coverage of economic events

This section studies how news reporting relates to economic events. More specifically, we investigate how negativity and total information of unemployment news respond to positive and negative changes in the unemployment rate.

To study asymmetries, we use a Threshold SVAR model (TSVAR). With respect to the simple regressions used in the political science literature, this type of model allows us both to address potential reverse causality issues and to capture interesting non-linear dynamics. The model *per se* is standard, but the way we use it is innovative. The main novelty is represented by the fact that the state variable in the model depends on the sign of the shock itself. Therefore, shocks of different signs imply different dynamics since the threshold variable is different. This feature, absent in standard TSVAR, is our methodological contribution and is discussed in detail below.

3.1 The model

Let y_t be a time series vector including the variables of interest following

$$y_t = (1 - F(z_t))[a + A(L)]y_{t-1} + F(z_t)[b + B(L)]y_{t-1} + \varepsilon_t \tag{1}$$

where $\varepsilon_t \sim WN(0, \Sigma)$ is a vector of white noise residuals, $A(L) = A_1 + A_2L + ... + A_pL^{p-1}$ and $B(L) = B_1 + B_2L + ... + B_pL^{p-1}$ are matrix polynomials in the lag operator L, z_t is a scalar variable, $F(\cdot)$ is a function taking value zero or one, and a and b are vectors of constant terms. We start from a minimal specification which includes in y_t, in this order, the unemployment rate change and either negativity (Section 3.2) or total information (Section 3.3) of unemployment news. In the robustness section, we use richer specifications and the results are largely unchanged. The state variable is the lag of the change in the unemployment rate, $z_t = \Delta U_{t-1}$, where U_t denotes the unemployment rate. This ensures that z_t is exogenous with respect to ε_t. We then set $F(z_t) = 0$ if $\Delta U_{t-1} \leq 0$ and $F(z_t) = 1$ if $\Delta U_{t-1} > 0$. The choice of the threshold variable is motivated by the fact that we are interested in understanding potential asymmetries in news dynamics to increases and reductions in the unemployment rate. Thus, $A(L)$ are the VAR parameters governing the dynamics of the system of variables when the first lag of the unemployment rate change is negative, while $B(L)$ are the VAR parameters in place when the change is positive. Under these assumptions, the model can be simply estimated using OLS.

To test whether increases and reductions in the unemployment rate receive asymmetric news coverage, we investigate the impulse response functions of either negativity or total information to an unemployment shock. To identify such shock, let S be the Cholesky factor of Σ, i.e. S is lower triangular and $SS' = \Sigma$, and let $u_t = S^{-1}\varepsilon_t$ be a vector of orthonormal shocks. The first shock, u_{1t}, is the innovation in the unemployment rate change which is orthogonal to u_{2t}, and it captures any factor that changes the unemployment rate unexpectedly. Such a shock does not have any structural interpretation. It is a combination of the different structural disturbances that drive the one-month-ahead forecast error in the unemployment rate change. The impulse responses to this shock represent how the system of variables evolves if the unemployment rate change in the next month is higher or lower than expected. The fact that the unemployment shock has no structural interpretation does not represents a limitation from our perspective, since our aim is just to understand whether news coverage reacts differently to positive and negative innovations in the unemployment rate change, regardless of the nature of the underlying shock.[9]

Notice that, with this model specification, the sign of the innovation in ΔU_t becomes the relevant state for the impulse response functions. To better understand the point, let

$$\beta(L) = (I - B(L)L)^{-1}S = \beta_0 + \beta_1 L + \beta_2 L^2 + ...$$

be the moving average representation of the model when $\Delta U_{t-1} > 0$ and

$$\alpha(L) = (I - A(L)L)^{-1}S = \alpha_0 + \alpha_1 L + \alpha_2 L^2 + ...$$

when $\Delta U_{t-1} < 0$. Call $\tilde{\beta}(L)$ and $\tilde{\alpha}(L)$ the coefficients associated with u_{1t}, i.e. the first row of $\beta(L)$ and $\alpha(L)$ respectively. Due to our identification strategy, the impact effects are the same across regimes and do not depend on the sign of the shock, i.e. $\tilde{\alpha}_0 = \tilde{\beta}_0 = S_1$, where S_1 is the first column of S.[10] For the generic horizon $h > 0$, the responses to the shock will be $\tilde{\alpha}_h$ if the change in the unemployment rate in $h-1$ is negative, and $\tilde{\beta}_h$ if positive. If the responses of the change in unemployment rate are sufficiently persistent, then one can simply condition, as we do here, on the sign of the impact effect and the responses are $\tilde{\beta}(L)$ for a positive shock and $\tilde{\alpha}(L)$ for a negative shock.

[9] Our approach is similar to Del Negro et al. (2020) that identify an orthogonal innovation in unemployment to study the effects of real business cycle shocks on economic variables in the context, however, of a linear VAR model.

[10] The assumption $\tilde{\alpha}_0 = \tilde{\beta}_0 = S_1$ is made for sake of interpretability of the results. The results are very similar to those obtained in the restricted model when we relax this assumption and we allow for two different impact effects.

To construct the confidence bands of the impulse responses, we use the bias-corrected estimator described in Kilian (1998), where we bootstrap the threshold variable, ΔU_{t-1}, together with the other regressors.

3.2 U-tone

In the first specification, we set $y_t = [\Delta U_t \text{ U-tone}_t]'$ and $p = 2$, as suggested by the BIC criterion.[11] The first two rows of Figure 3 report the results. The left-hand panels show the responses to negative (blue lines) and positive (red lines) shocks to the unemployment rate change. The solid lines are point estimates, while the dashed-dotted lines are 68% confidence bands. The right-hand panels report the sum of the impulse response functions (black lines) to positive and negative shocks. The solid line is the sum in the point estimates, while the dashed-dotted lines are the 68% confidence bands. This sum can be interpreted as a measure of asymmetry. Under perfect symmetry of the responses, the sum is zero. The larger (in absolute value) the sum is, the larger the degree of asymmetry is.

Negativity reacts more, and with a higher degree of persistence, to an increase in the unemployment rate than to a reduction. Indeed, the asymmetry index is positive and significant over the horizon considered. The magnitude of this asymmetry is sizable. An increase in the unemployment rate of 0.15 percentage points on impact generates, on average over the horizon considered, about 5 more bad news items than good news items per month. However, a reduction of the same magnitude generates less than one good news more than bad news items per month. This suggests that the negativity of media coverage reacts asymmetrically to economic developments, giving a substantially greater weight to negative events than to positive events.

This result is in line with the findings in Soroka (2006) and Soroka et al. (2018). If our analysis was to stop here, we would confirm the existence of a *negativity bias* in newspaper coverage of economic events. However, as noticeable from the first row of Figure 3, there is also a sizable and significant asymmetry in the effects on the unemployment rate change: positive shocks have larger and more persistent effects than negative shocks. So, when comparing the effects on media negativity of increases and decreases in the unemployment rate, the different dynamics of unemployment should be taken into account. Indeed, the larger response of negativity to an increase in the unemployment rate could simply be due to a larger and more prolonged effect of the positive shock on unemployment.

We therefore compute a dynamic *Media Multiplier* of economic fluctuations. The mul-

[11] Using the levels of the unemployment rate or using more lags yields very similar results.

tiplier is constructed as the cumulative sum of the impulse response functions of negativity divided by the cumulative sum of the changes in the unemployment rate at every horizon. For instance, at a horizon of 48 months ahead (the last horizon of the impulse response functions), the multiplier can be interpreted as the total number of bad news items in excess of good news items produced over four years following a 1 percentage point change in the unemployment rate. The responses are shown in the two bottom panels of Figure 3. The multipliers for increases and reductions in the unemployment rate are extremely similar, with no significant asymmetries. At the four year horizon, a 1 percentage point increase in unemployment generates 305 bad news items in excess of good news items, while a decrease of the same magnitude generates 292 good news items in excess of bad news items. The result suggests that, when nonlinearities in the dynamics of the unemployment rate are taken into account, the media bias towards bad events disappears. The result is new and contrasts with the evidence pointing to the existence of a *negativity bias* in economic news coverage (see Soroka et al. (2018) for a review). The reason our result differs substantially from previous findings in the literature is the fact that none of the earlier studies accounted for the asymmetry in the dynamics of unemployment.

3.3 U-total

We repeat the analysis of the previous subsection, using model (1) with a different variable specification. Now, $y_t = [\Delta U_t \text{ U-total}_t]'$. Apart from this, the model specification is identical to the previous one. The first two rows of Figure 4 report the results. The left-hand panels report the responses to negative and positive shocks to the unemployment rate change. The right-hand panels report the sum of the impulse response functions to positive and negative shocks.

The asymmetry between positive and negative shocks is clear. Shocks that push up unemployment increase total information substantially more, and with a higher degree of persistence, than shocks that improve unemployment figures. The asymmetry index is always significant over the horizon considered and the differences are sizable. A 0.15 percentage point increase in the unemployment rate on impact generates up to 25 news items more than a 0.15 percentage point reduction. However, the shock, as for negativity, generates a marked nonlinearity in the response of the unemployment rate change, which is much more persistent for bad shocks than for good shocks. As before, we compute the *Media Multiplier*, i.e. we re-scale the cumulative impulse response functions of total information by the cumulative change in unemployment. The responses are reported in the third row of Figure 4. When taking into

account the dynamics of unemployment, the asymmetries in the news reporting process are substantially dampened, the responses of total information to positive and negative shocks being essentially the same and the asymmetry index being never significantly different from zero.

The conclusion of this first part of the analysis is that the apparent asymmetry in the news reporting process of economic events found in previous work does not depend on media bias *per se*. It depends on the large non-linearity in the unemployment rate response to economic shocks. Unemployment responds more, and with a higher degree of persistence, to bad shocks, i.e. shocks that imply an increase in unemployment. This triggers an important asymmetry in both negativity and total information of unemployment news.

To understand whether our results are consistent with the evidence from previous studies, we run two simple linear regressions where the dependent variables are, respectively, our measures of negativity and total information of news, and the regressors are the current value of positive unemployment changes, the current value of negative unemployment changes and four lags of the dependent variable. This specification closely resembles the regression in Soroka (2006). The results of the two regressions are displayed in Table 1. In both regressions the coefficients associated with increases in unemployment are larger than those associated with a reduction, and only the former are significant. So, by neglecting the non-linearity in the response of the unemployment rate change, one would conclude, as previously done in the literature, in favor of a negativity bias in news reporting of economic events. Above we showed that the conclusion is different if asymmetries in the response of unemployment are also considered.

4 Asymmetric responses to news

We now focus on the second type of asymmetry we want to test for: the response of agents' consumption, information and expectations to bad and good news shocks, as measured by positive and negative unexpected changes in negativity.

4.1 The model

The first problem we have to confront when assessing the role of bad and good news is that negativity is highly correlated with the unemployment rate: unemployment increases (reduces) and negativity increases (reduces). This implies that potential asymmetries could mistakenly be attributed to a different response of economic agents to bad and good news,

while these actually arise simply because agents' responses differ in the face of bad and good economic shocks.

To cope with this issue, we focus on changes in the component of negativity that are orthogonal to contemporaneous and past changes in the unemployment rate. We use the results obtained from Section 3.2 to obtain such component. There, the shock u_{2t} has the interpretation of a news shock: it triggers a change in negativity with a zero impact effect on the unemployment rate.[12] Thus, the component of negativity generated by this shock is unrelated to current or past changes in the unemployment rate. This component is obtained from the TSVAR of Section 3.2 by filtering the shock u_{2t} with the corresponding impulse response functions of the two regimes:[13]

$$x_t = (1 - F(z_t))\alpha_{22}(L)u_{2t} + F(z_t)\beta_{22}(L)u_{2t}, \tag{2}$$

Notice that the news component of negativity, x_t, takes into account the asymmetric effects of the unemployment shock documented in Section 3.2. That is, it controls for the fact that unemployment responds more, and with a larger degree of persistence, to positive unemployment shocks. This is particularly important since, as we have seen in the previous section, the negativity bias in economic news coverage disappears after controlling for this asymmetry. Using this component will therefore allows us to avoid confounding asymmetries due to news with other types of asymmetries associated with positive and negative changes in the unemployment rate.

We then estimate a new TVAR model (1) with an alternative variable specification setting $y_t = [\Delta x_t \; w_t]'$, where w_t is a vector of time series of interest. Again, we select two lags of the dependent variable using the BIC criteria. The state variable is now the difference of the news component of negativity, $z_t = \Delta x_{t-1}$. We define $F(z_t) = 1$ if the change in negativity is positive, $\Delta x_{t-1} > 0$, and $F(z_t) = 0$ if the change in negativity is negative, $\Delta x_{t-1} \leq 0$. The choice of the threshold variable is motivated by the fact that we are interested in understanding potential asymmetries to increases and reductions in negativity. With this specification, the coefficients $A(L)$ in (1) are the VAR parameters governing the dynamics when the first lag of the difference in negativity is negative, while $B(L)$ are the VAR parameters in place when the difference is positive.

[12]The identification of the news shock follows the seminal paper by Beaudry and Portier (2006), the main difference being that we use unemployment rather than TFP, so that the resulting shock can be interpreted as an unemployment-related news shock.

[13]Recall that $\alpha_{22}(L)$ and $\beta_{22}(L)$ are the elements (2,2) of, respectively, the impulse response functions $\alpha(L)$ and $\beta(L)$ obtained using the specification of Section 3.2.

To test whether increases and reductions in the news components of negativity, Δx_t, have asymmetric effects, we identify a news shock in this second specification. Since Δx_t already represents the news component of negativity, the news shock here is imply identified as the orthogonal innovation innovation in Δx_t. The implementation again entails a recursive decomposition. Let S be the Cholesky factor of Σ, i.e. S lower triangular and $SS' = \Sigma$, and let $u_t = S^{-1}\varepsilon_t$. The first shock, u_{1t}, is the innovation in negativity which is orthogonal to u_{2t}. Again, conditional on a shock, the sign of the shock becomes the relevant state. When the shock u_{1t} is positive, Δx_t is positive, and the relevant impulse response functions are the first column of $\beta(L) = (I - B(L)L)^{-1}S$, call it $\beta_1(L)$. When the shock is negative, Δx_t is negative and the impulse response functions will be the first column of $\alpha(L) = (I - A(L)L)^{-1}S$, call it $\alpha_1(L)$. Notice that our procedure is equivalent to an internal instrument approach using Δx_t as an instrument for the news shock, see Plagborg-Møller and Wolf (2021), since the instrument satisfies both the relevance and the exogeneity condition.

Again, the Cholesky decomposition is just a statistical device to obtain the orthogonal innovation to the news variable. The shock admittedly lacks of any structural interpretation: it could be an economic news shock, a shock capturing any distortions in journalists view, a fake news shock, etc. However, independently on its nature, the shock represents an unexpected change in the negativity of unemployment news which is orthogonal to current and past unemployment. This is precisely the component we aim at disentangling in order to study the causality link from news to economic variables. One potential concern could be that other shocks which affect unemployment with a delay could be reflected into this component. In the robustness section, we estimate a richer specification which includes additional macroeconomic indicators or forward-looking variables in the model of Section 3.2 and show that the results are largely unchanged.

To construct confidence bands for the impulse responses, we use the bias-corrected estimator described in Kilian (1998) and we bootstrap the threshold variable, Δx_{t-1}, together with the other regressors.

We use three different TVAR models to study the effects on personal consumption expenditures, consumers' information and expectations. The choice of not using a single model with all of the variables is driven by parsimony considerations and to avoid the curse of dimensionality.

4.2 Consumption

In this subsection, we use our model to test for potential asymmetries in the responses of consumption to good and bad news. To test for this asymmetry, we include in w_t the logarithms of real total personal consumption expenditures (PCE), real durable goods consumption expenditures (PCE Durable) and real non-durable goods consumption expenditures (PCE Nondurable).

Figure 5 reports the effects of positive and negative shocks in negativity of news coverage on consumption. Figure 6 shows the asymmetry indexes. As before, solid lines are point estimates, while the dashed-dotted lines are 68% confidence bands constructed using the Kilian (1998) bias-corrected bootstrap. A clear-cut result emerges. A bad news shock significantly and persistently reduces the three types of consumption, especially of durable goods, while a good news shock has essentially no effects. The three asymmetry indexes are significantly negative at almost all of the horizons considered.

We now re-scale the responses for the cumulative effect on negativity to take into account the potential non-linearity in the response of news itself. Again, the differences could simply be due to a larger increase in negativity following a bad shock. Figures 7 and 8 plot the normalized responses of the three types of consumption to negativity shocks and the corresponding asymmetry indexes. Asymmetries are still apparent, with the asymmetry indexes significantly negative over the horizons considered. Consumption reacts asymmetrically to positive and negative shifts in negativity. This result echoes previous evidence which documents a stronger response of consumption growth to predictable income declines than increases in the context of a single regression setup (see Shea (1995) and Bowman et al. (1999)). In the next two subsections, we show that this result is consistent with the responses of indicators of agents' information and expectations.

4.3 Consumers' information

In our second specification, we include in w_t three variables of the Michigan Survey of Consumers related to consumers' information (Questions A6 and A6a). The first variable is simply the difference between the percentage of "unfavorable" and "favorable" responses to question A6a. The second variable is the percentage of "No news" to question A6. This second variable measures the percentage of individuals who have not heard any news about current economic conditions and can therefore be interpreted as a proxy of the inverse of information. The third measure is the entropy associated to the answers in question A6 and A6a.

Entropy can be interpreted as a proxy for consumers' agreement about news and is constructed as follows. Let P_t be the sum of responses "No, haven't heard" in question A6, "Favorable" and "Unfavorable" in question A6a. Let p_{1t} be the proportion of "Favorables" over P_t at time t and p_{2t} the proportion of "Unfavorable" over P_t. Entropy is constructed as

$$e_t = -(p_{1t}\log(p_{1t}) + p_{2t}\log(p_{2t}) + (1 - p_{1t} - p_{2t})\log(1 - p_{1t} - p_{2t}))$$

The larger the entropy is, the larger the disagreement among agents about the news heard, and vice-versa. Maximum disagreement is reached when respondents allocate the same proportion (1/3) to each answer from the survey.

Figure 5 reports the impulse response functions of the three variables, and Figure 6 reports the asymmetry indexes. Conditional on being informed, agents' information reacts quite symmetrically to positive and negative changes in negativity. Indeed, the response of "Unfavorable" minus "Favorable" to a positive shock is essentially the mirror image of the response to a negative shock. This is reflected in the asymmetry index for this variable, which is mostly insignificant over the horizon considered. Following a bad news shock more respondents report that they heard unfavorable news relative to favorable news, and vice-versa for good news shocks.

The key difference is the response of "No news". A positive shift in negativity significantly increases the number of informed consumers. Indeed, the percentage of consumers reporting "No, haven't heard" decreases. A negative shift, on the other hand, significantly increases the number of individuals who have no information. Altogether, this evidence suggests that while bad news is informative, good news is not. A similar indication is obtained by inspecting the response of entropy. Bad news shocks increase agents' agreement, while good news shocks increase disagreement.[14] In conclusion, a rise in negativity of unemployment news increases consumers' information and agreement, while a reduction has the opposite effect.

Figures 7 and 8 plot the normalized responses and the corresponding asymmetry indexes. The main results are unchanged, confirming the above evidence suggesting that bad news is more informative and agents agree more in response to bad rather than good news.

[14]The same conclusion is reached if we construct entropy based on favorable and unfavorable news heard only, thus excluding the percent of respondents which state that they heard no news. In this case, maximum disagreement corresponds to an equal proportion (1/2) of respondents reporting that they heard unfavorable and favorable news. Results are available upon request.

4.4 Consumers' expectations and confidence

In the third specification, we add the logarithms of the current economic conditions index (ICC) and of the index of consumer expectations (ICE) from the *Michigan Survey of Consumers* in vector w_t. The two indexes are constructed using survey variables relative to expected current and future, personal and general economic conditions, and are components of the index of consumer sentiment.

Figure 5 reports the impulse response functions of the two variables to bad and good news shocks. Figure 6 reports the asymmetry indexes. An increase in negativity has larger and more persistent effects on the two indexes of consumer sentiment than a reduction. Indeed, the asymmetry indexes reduce significantly and persistently over the horizon considered. Agents' expectations react more to bad news than to good news.

Figures 7 and 8 plot the normalized responses and the corresponding asymmetry indexes. Once we re-scale the responses for the potentially non-linear effect on negativity, the main results are unchanged. This finding confirms the above evidence, suggesting that expectations indeed react more to a rise in negativity than to a decline. This result is in contrast to those obtained in Casey and Owen (2013) who find that the exogenous components of good and bad news have no effect on consumer confidence, but confirm the findings of Soroka (2006).

The results presented in this section and Section 4.3 are consistent with the findings discussed in Section 4.2. A rise in negativity is much more informative than a decline, it makes agents revise their expectations more deeply and, consequently, their consumption path. This expectation revision cannot be explained by a higher number of negative news (for which we control here), as previously documented in the literature and as implied by models of *sticky expectations* (Carroll (2003)). On the contrary, the type of asymmetry we document suggests that, given an equal number of good and bad news items, agents give greater weight to negative information than positive information. The existence of a negativity bias in consumers' response to news has been extensively discussed and studied in political science, biology and psychology (see Soroka (2014) and Baumeister et al. (2001)). In economics, the idea that agents may value losses more than equivalent gains is formalized in the concept of *loss aversion*. This could explain why agents are more attentive to signals (news) reporting a higher risk of utility losses than gains and react more to the former. Our findings are also consistent with the implications of the model in Tutino (2013) which features risk-aversion in an otherwise standard *rational inattention* setup. Risk-aversion implies that individuals in the model are more concerned with future decreases in their wealth than increases so that they allocate more attention and react faster and stronger to bad news than to good news.

5 Robustness

We perform three main robustness checks on the models of Section 3 and Section 4. First, we estimate the models excluding the Great Recession period, using data up to December 2007. Results are reported in Figures 11-14 in the Online Appendix. The responses of negativity and total information are very similar to those obtained using the full sample. A positive change in unemployment causes a much larger and persistent increase in negativity and total information than a negative change. The two asymmetry indexes are always positive and significant. As far as the re-scaled responses are concerned, asymmetries are again mitigated, although for total information the difference is statistically significant. By excluding the Great Recession, media negativity bias seems to be somehow more important when considering total information. The response of "no news", entropy and the two confidence indexes are qualitatively similar to those obtained in the full sample, conveying the same message: bad news appears to be more informative, reduces disagreement and has a more marked effect on confidence. Total consumption and durable consumption still decrease to a greater extent in the face of negative news, while non-durable consumption is not responsive to negative or positive news. All in all, the results, although with some quantitative differences, depict a similar picture to that arising from the full sample case.

Second, we repeat the analysis including in the TSVAR of Sections 3.2 and 3.3 also industrial production growth and PCE inflation, ordered after the unemployment rate and before negativity or total information. This means that the component of negativity we consider for the model of Section 4 is now unrelated to changes in the unemployment rate, as well as industrial production growth and PCE inflation. The *rationale* for this exercise is that the unemployment rate is a lagging variable, so the estimated news component in our baseline model could still include cyclical shocks which affect unemployment with some delay. Figures 15-18 in the Online Appendix report the results, which are very similar to the baseline specification.

Third, we add to the baseline models of Sections 3.2 and 3.3 stock prices growth (as measured by the S&P500 index), ordered last. The component of negativity unrelated to unemployment now takes into account the inclusion of this forward-looking variable in the previous step. Figures 19-22 in the Online Appendix present the results, which are essentially unchanged compared to the baseline specification.

6 Concluding remarks

We provide novel empirical evidence on the asymmetric relationship between economic news coverage, agents' information and expectations, and macroeconomic dynamics. Using nonlinear SVAR techniques and two novel measures of newspaper coverage of bad and good economic events, we document three facts: (i) There is no significant negativity bias in newspaper coverage of the economy. News coverage is more responsive to negative than positive economic shifts because bad economic shocks have larger and more persistent effects on economic variables than good shocks; (ii) consumption, especially of durable goods, reacts to bad news but not to good news. This finding can be rationalized by the fact that (iii) bad news is more informative for agents than good news. Indeed, the percentage of informed individuals increases facing a rise in bad news relative to good news, while it decreases for the reverse. Bad news increases agents' agreement about economic outcomes and modifies their expectations more than good news.

A potential explanation for the existence of a negativity bias in the consumer's reaction to news is loss aversion. In a world where the utility reduction induced by a loss is higher than the utility increase from a gain of the same amount, agents can be more attentive to economic news reporting a risk of losses than a risk of gains. Higher agents' information can in turn lead to larger consumption fluctuations. We plan to test this implication in our future research.

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Appendix

A.1 - U-news indexes

We construct our U-news^{+} and U-news^{-} indexes using newspaper articles from *Dow Jones Factiva*. We focus our search to three major US newspapers, in terms of circulation, namely *The Wall Street Journal*, *The New York Times* and *The Washington Post*, and to news related to the US economy over the time period from June 1980 to December 2019. For each newspaper, we look for all the articles, in a given month, in which the word "unemployment" appears within a predetermined distance, in any order, to another word that denotes a negative or positive development. More specifically, we first define two semantic groups, one containing words which share a root denoting an increase or high level (*group 1*) and another containing words which share a root denoting a decrease or low level (*group 2*):

- *group 1*. The words included in this group have one of the following roots: "high-", "increas-", "ris-", "rose-", "soar-", "rais-" or "up-".
- *group 2*. The words included in this group have one of the following roots: "down-" or "low-" or "slow-" or "decreas-", "drop-", "fall-", "fell-", "slip-", "declin-".

We classify an article as a *bad news* item if the word "unemployment" appears within a 5-word distance to a word belonging to semantic *group 1*, but not within a 1-word distance to a word in semantic *group 2*. Symmetrically, we define an article as a *good news* item if the word "unemployment" appears within a 5-word distance to a word belonging to semantic *group 2*, but not within a 1-word distance to a word in semantic *group 1*. We choose the 5-word distance criteria to maximize the probability that the corresponding word in *group 1* (bad news) or in *group 2* (good news) is related to the word "unemployment" and not to other words. We obtain very similar results if we restrict this criteria to 4-word or 3-word distance. Given this first classification, we then clean our two measures of bad and good news by substracting, for both measures, the number of articles that can be classified as belonging to both groups according to our criteria. In fact, this class of articles cannot be clearly classified as positive or negative, either because these articles deliver mixed signals about unemployment,[15] so that their resulting tone is *neutral*, or because the word "unemployment"

[15]For example, on the 12th of March 2010, *The Wall Street Journal* writes "[...] initial claims for unemployment insurance dropped to 462,000 in the week ended March 6th, down 6,000 from the week before. Meanwhile, the number of people collecting unemployment checks rose 37,000 to 4.6 million in the week ending Feb. 27".

is incidentally mentioned close to a word in *group 1* and *group 2*, even if the article does not include direct information about unemployment (e.g. articles reporting presidential talks close to the elections). The articles belonging to this last category represent on average 6% of total articles over the period considered. After cleaning the measures, the number of all *bad news* in a given month is the value of the U-news^{+} index for that month, while the number of all *good news* in a given month is the value of the U-news^{-} index for that month.

A.2 - Alternative search

An alternative measure of good news can be derived based on the word "employment" as opposed to "unemployment". We define the variable E-news^{+} as the total number of articles, in each month, in which the word "employment" appears within a distance of 5 words to a word denoting an increase or high level, i.e. to a word belonging to semantic *group 1*, according to the definition in Appendix A.1. As before, we clean this measure by removing all the articles that are selected under both good and bad search criteria.

Tables

Table 1: Regression

	U-tone		U-total	
	Estimate	t-stat	Estimate	t-stat
$\Delta U_t > 0$	29.66*	2.37	28.09*	2.25
$\Delta U_t < 0$	2.30	0.19	14.84	1.18
Lag 1	0.44*	9.30	0.55*	11.65
Lag 2	0.30*	6.05	0.19*	3.57
Lag 3	0.18*	3.54	0.07	1.37
Lag 4	-0.01	-0.24	0.08	1.83
Constant	0.53	0.32	12.06*	3.49

Note: $*$ means significant at the 5% significance level.

Figures

Figure 1: Bad news, good news and unemployment

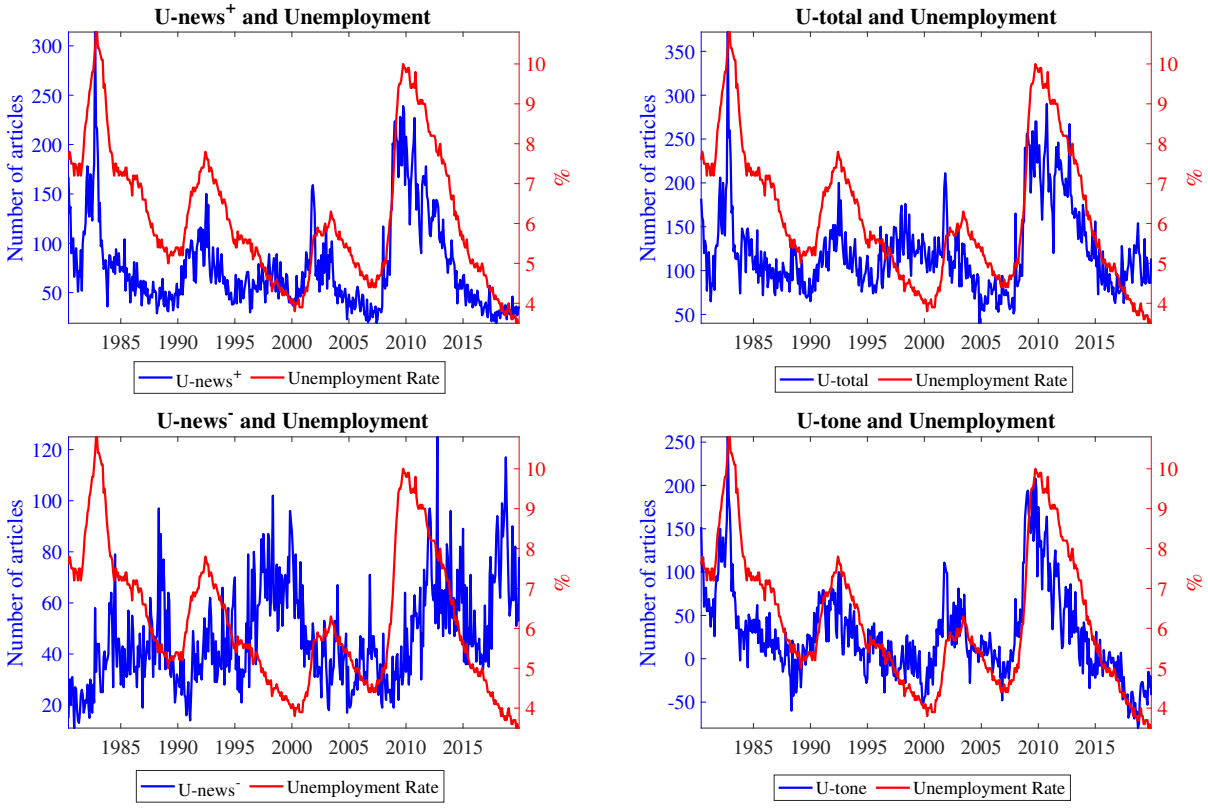


Figure 2: Bad news, good news and Michigan news

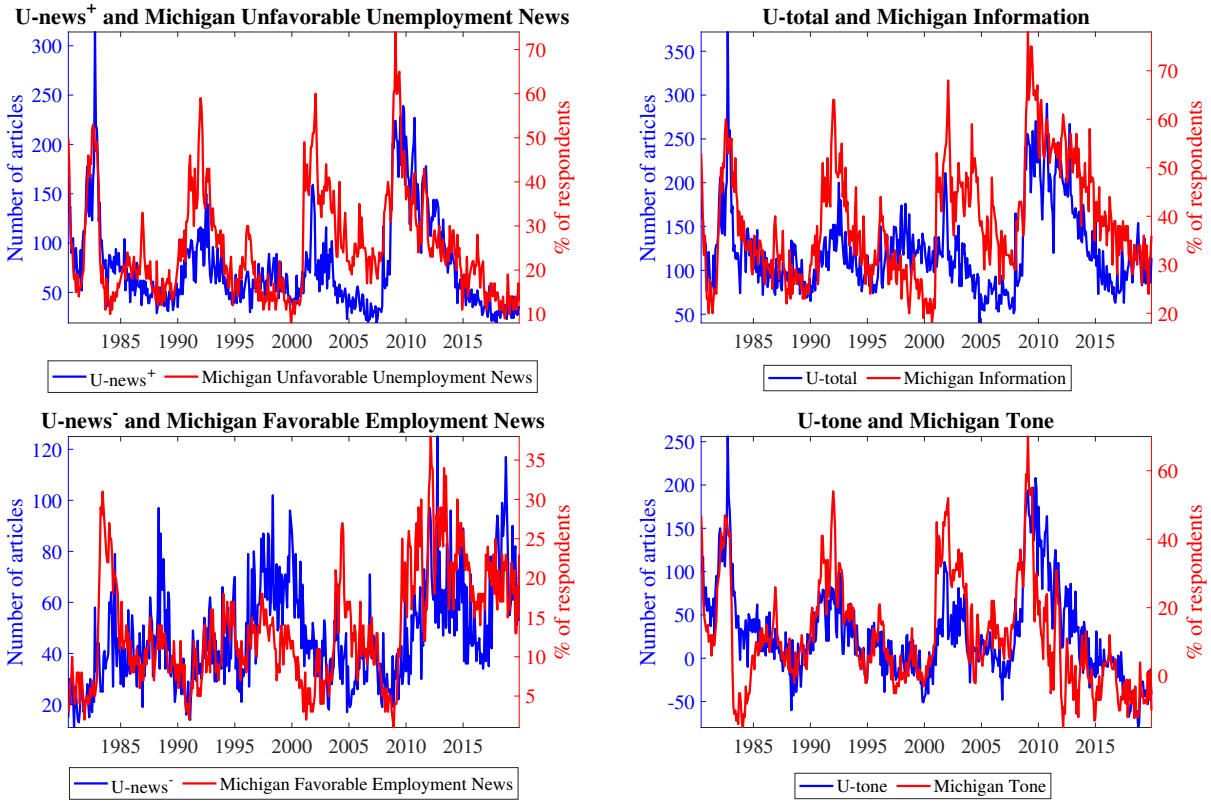


Figure 3: Response of news coverage to unemployment changes - U-tone

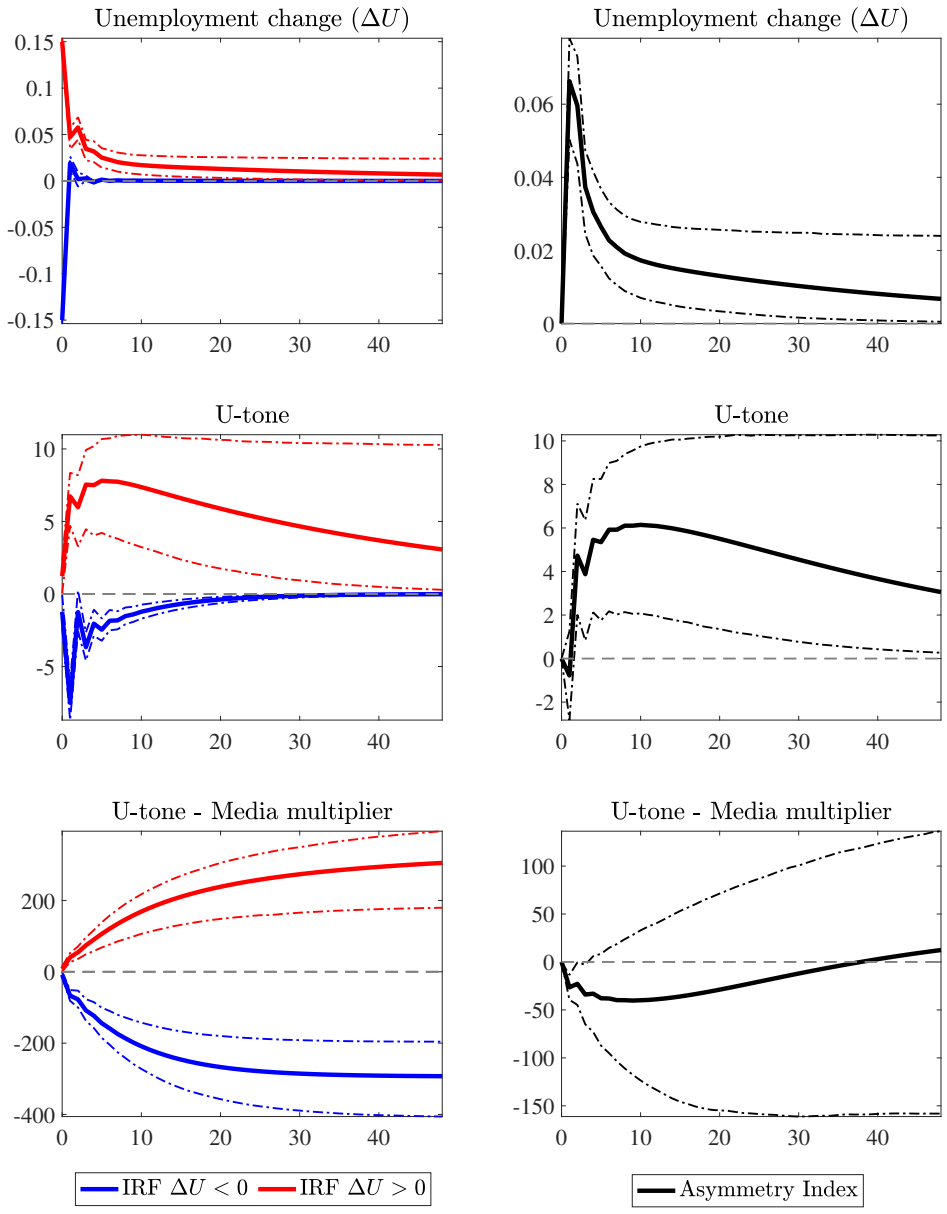


Figure 4: Response of news coverage to unemployment changes - U-total

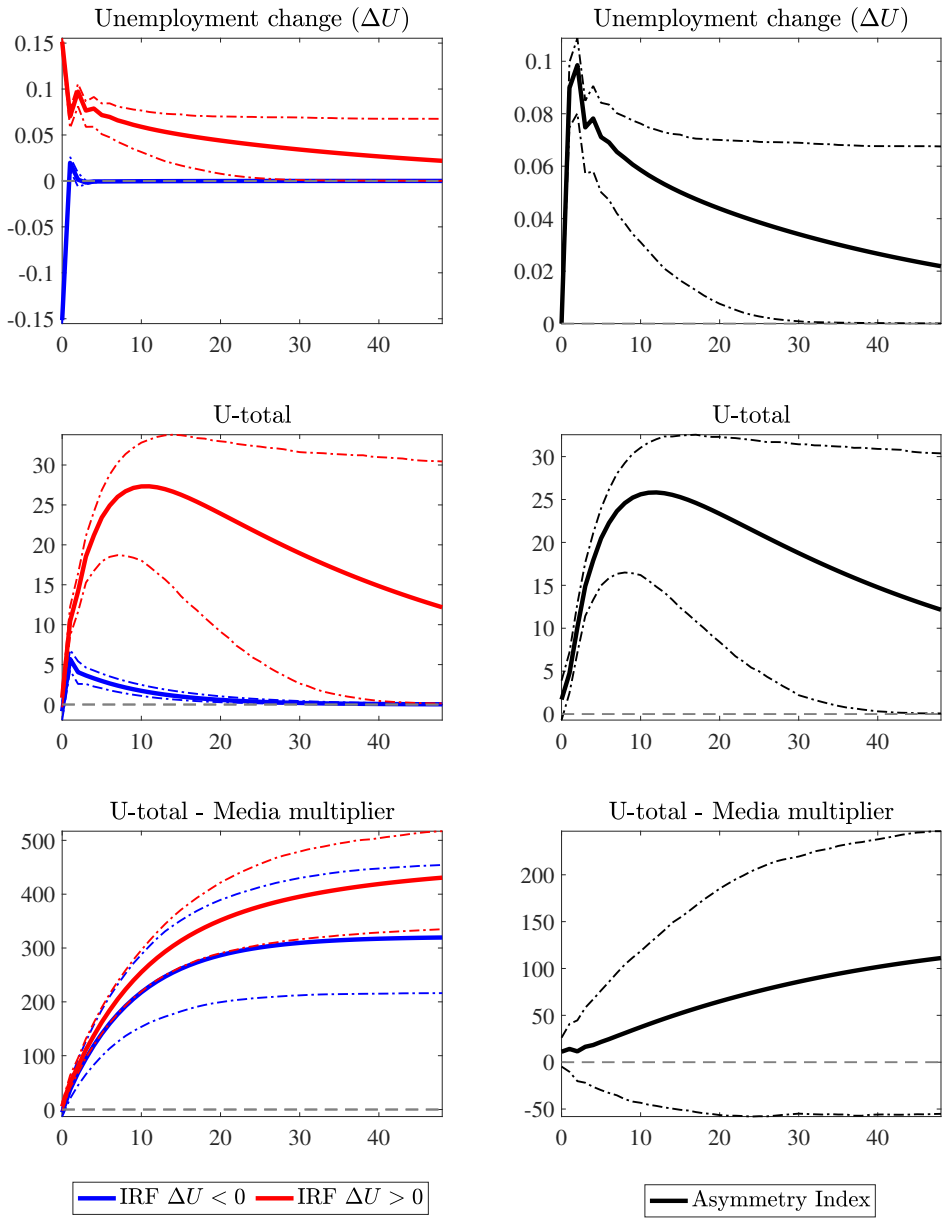


Figure 5: Asymmetric effects of news - IRFs

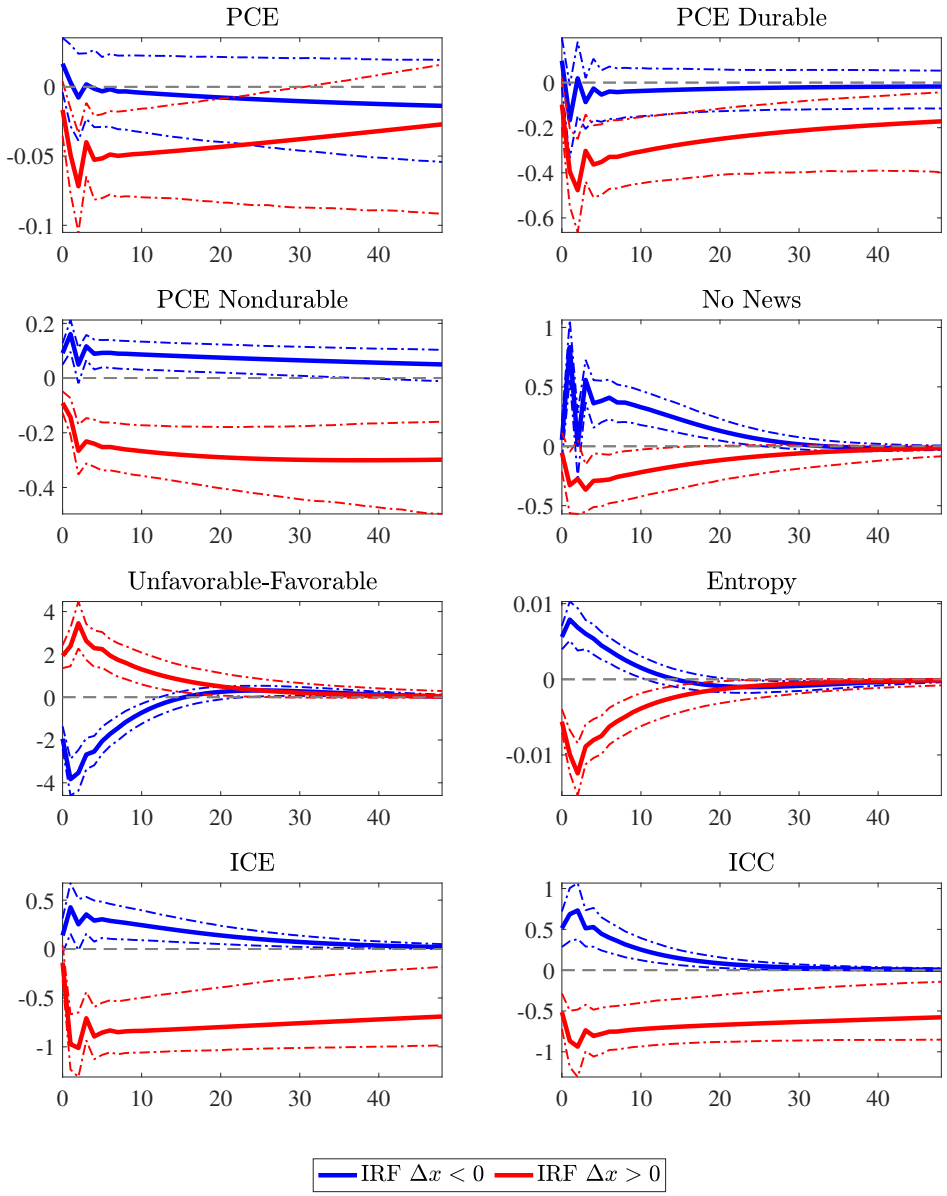


Figure 6: Asymmetric effects of news - Asymmetry Indexes

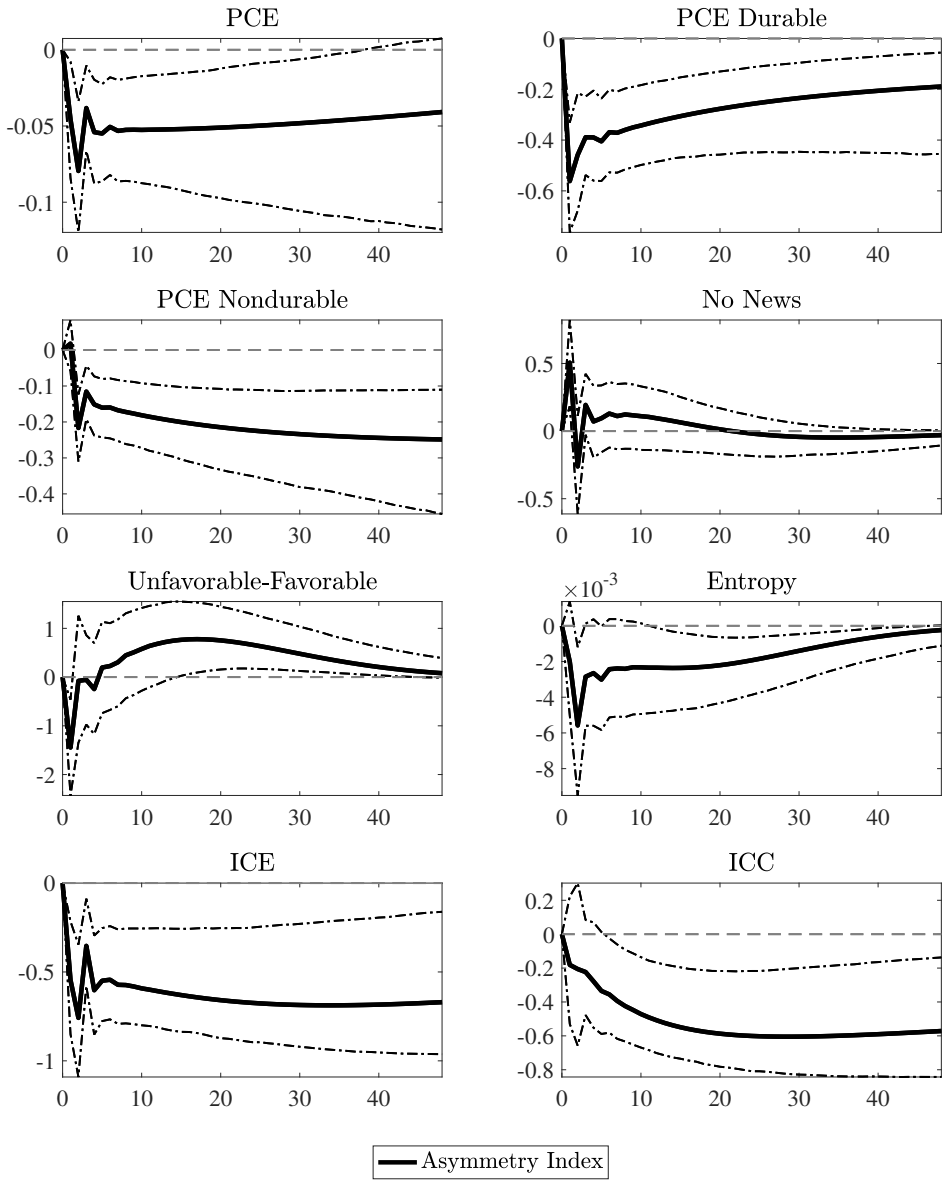


Figure 7: Asymmetric effects of news - Normalized

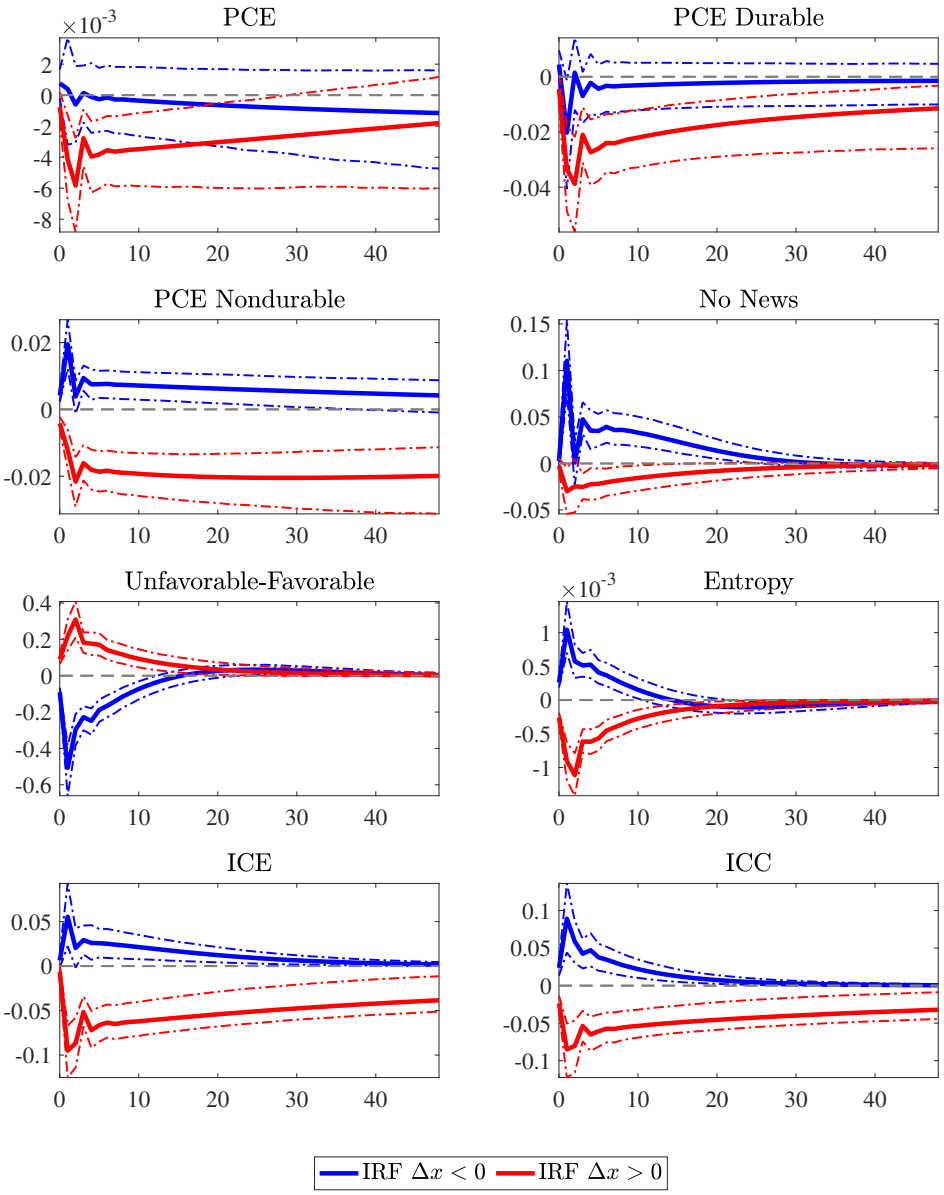
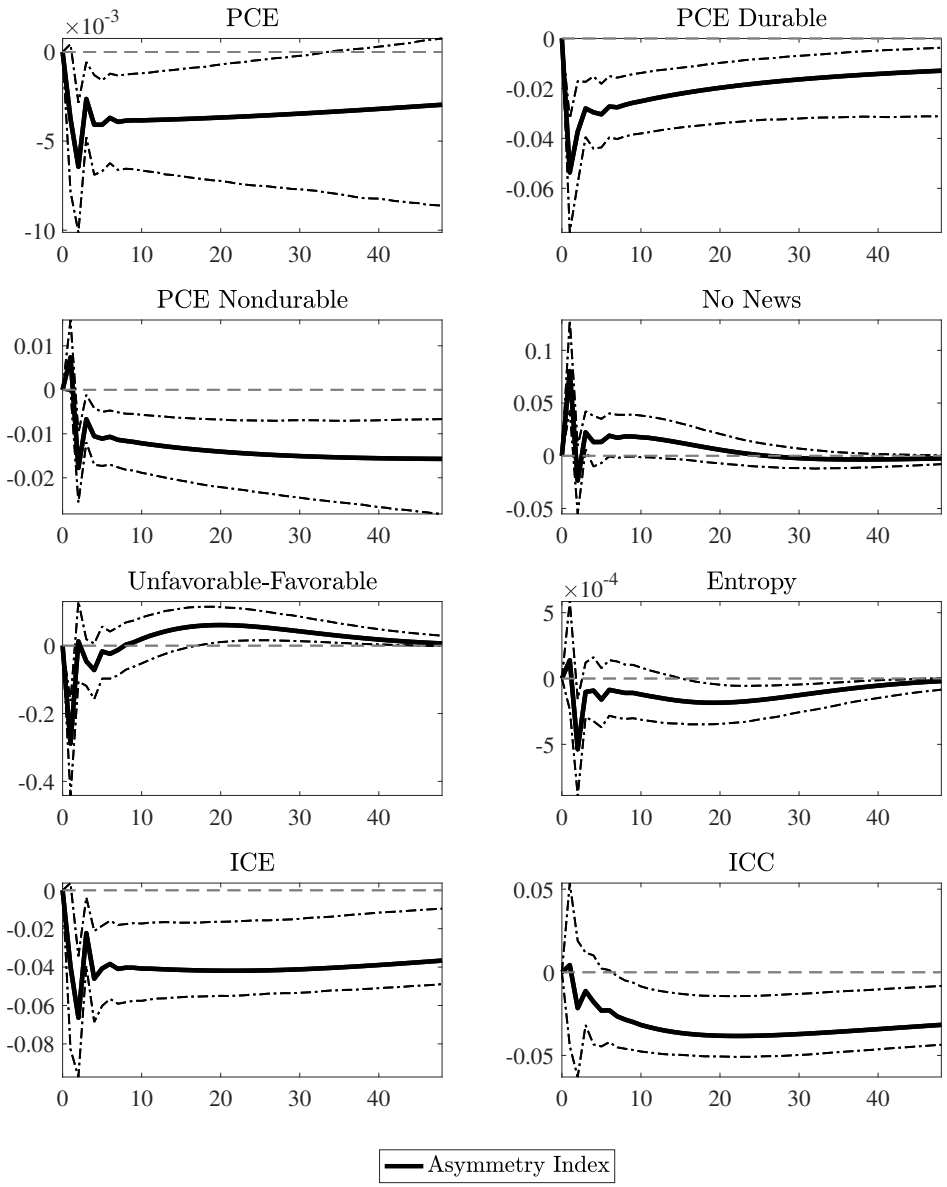


Figure 8: Asymmetric effects of news - Normalized - Asymmetry Indexes



Online Appendix

Figure 9: Bad news and good news by newspaper

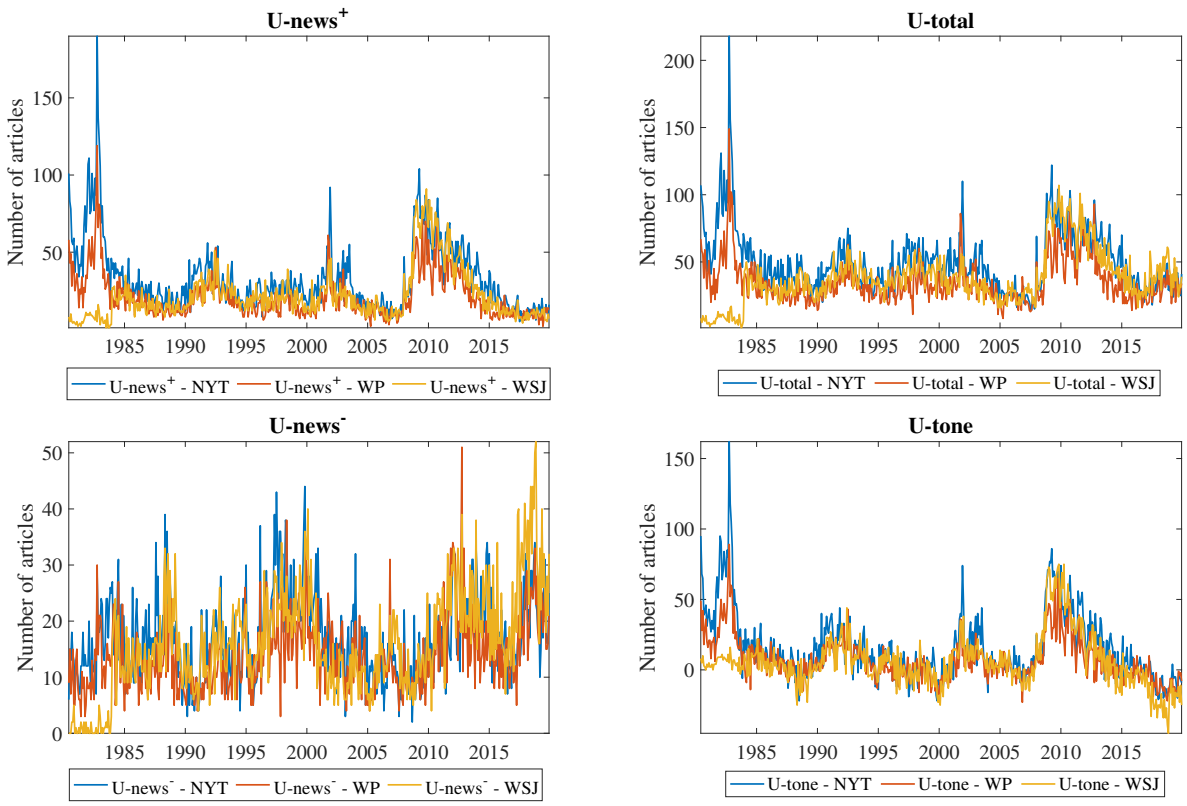


Figure 10: Alternative measure of good news - E-news^{+}

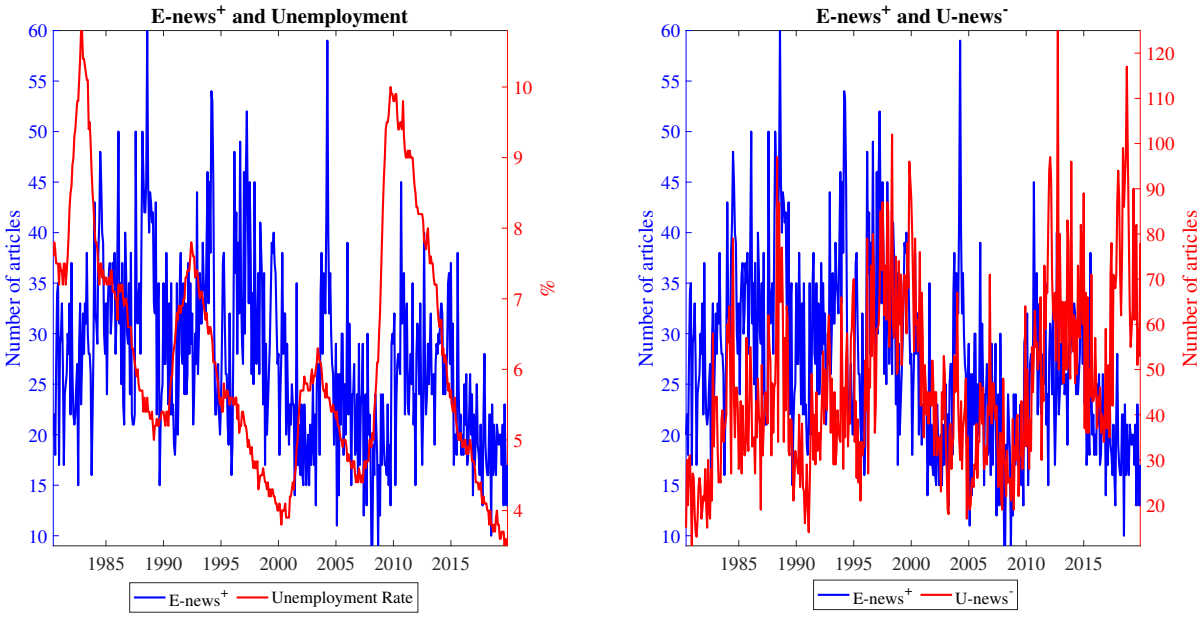


Figure 11: Response of news coverage to unemployment changes - U-tone - Sample excluding the Great Recession (1980:06 - 2007:12)

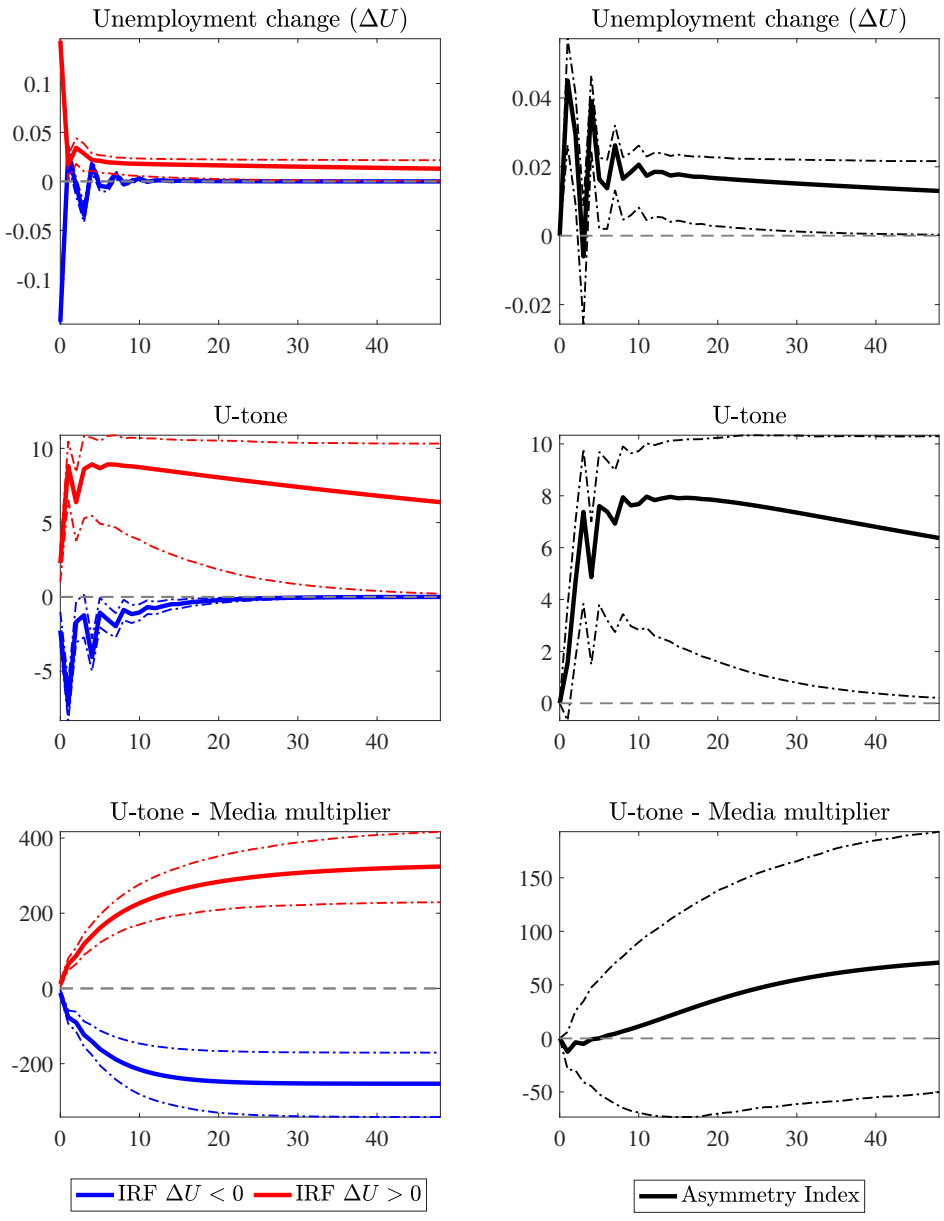


Figure 12: Response of news coverage to unemployment changes - U-total - Sample excluding the Great Recession (1980:06 - 2007:12)

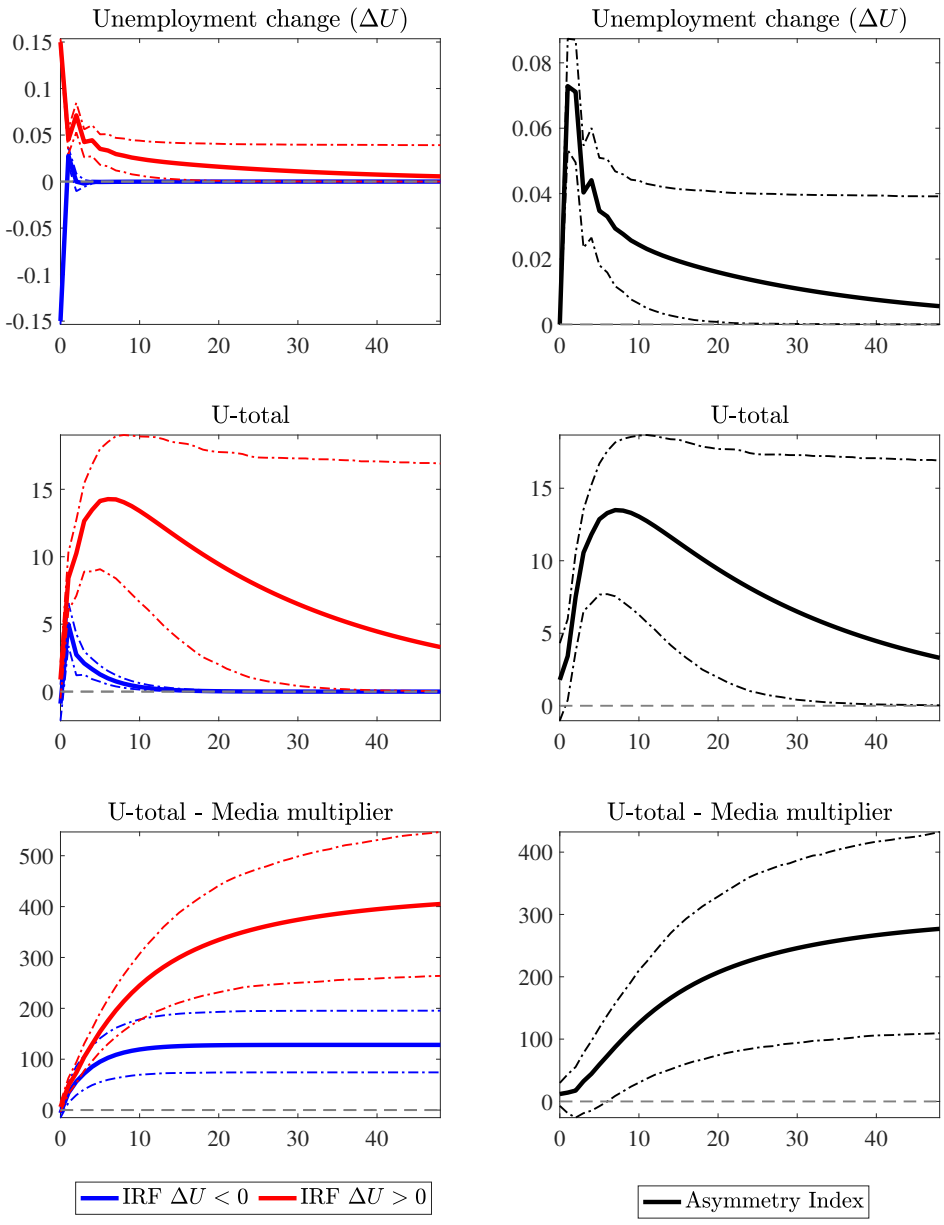


Figure 13: Asymmetric effects of news - IRFs - Sample excluding the Great Recession (1980:06 - 2007:12)

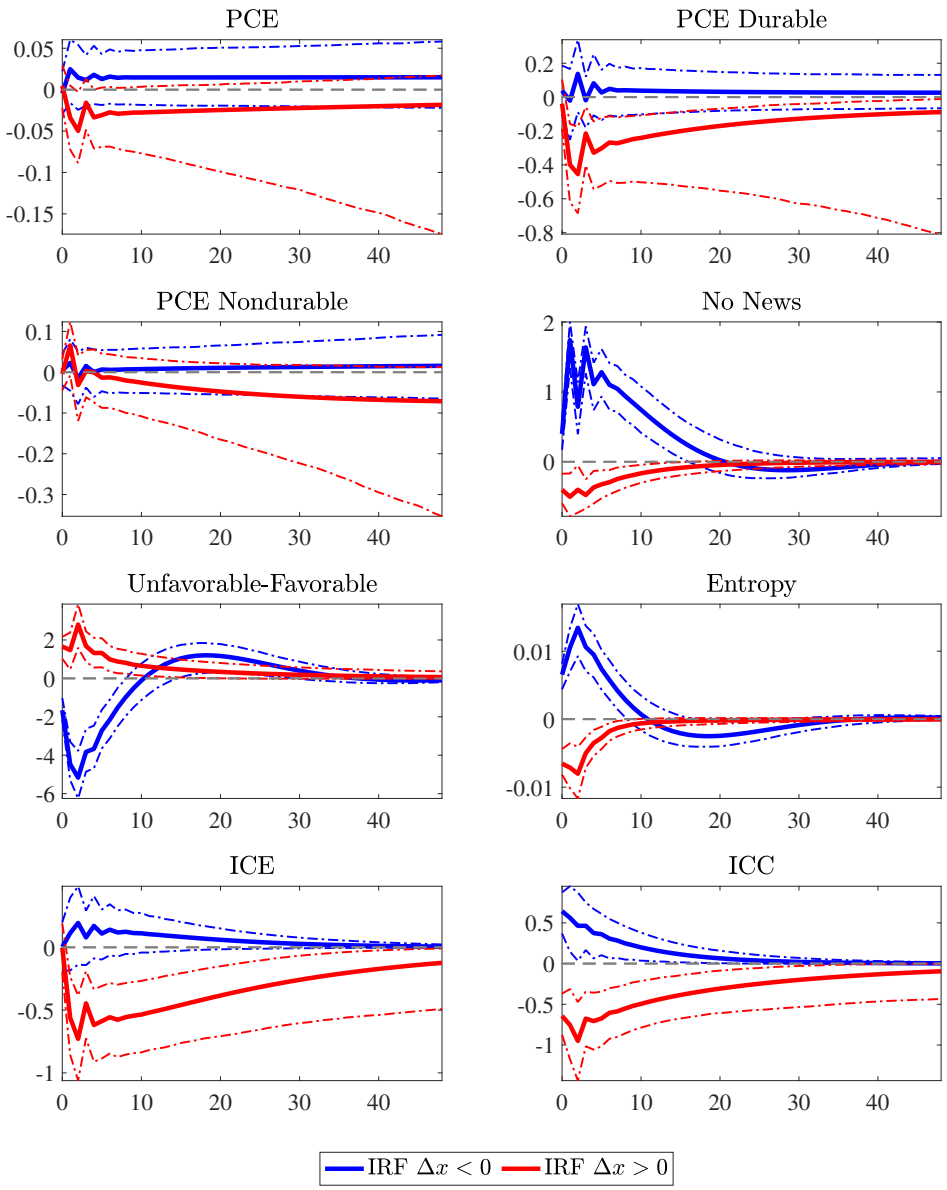


Figure 14: Asymmetric effects of news - Asymmetry Indexes - Sample excluding the Great Recession (1980:06 - 2007:12)

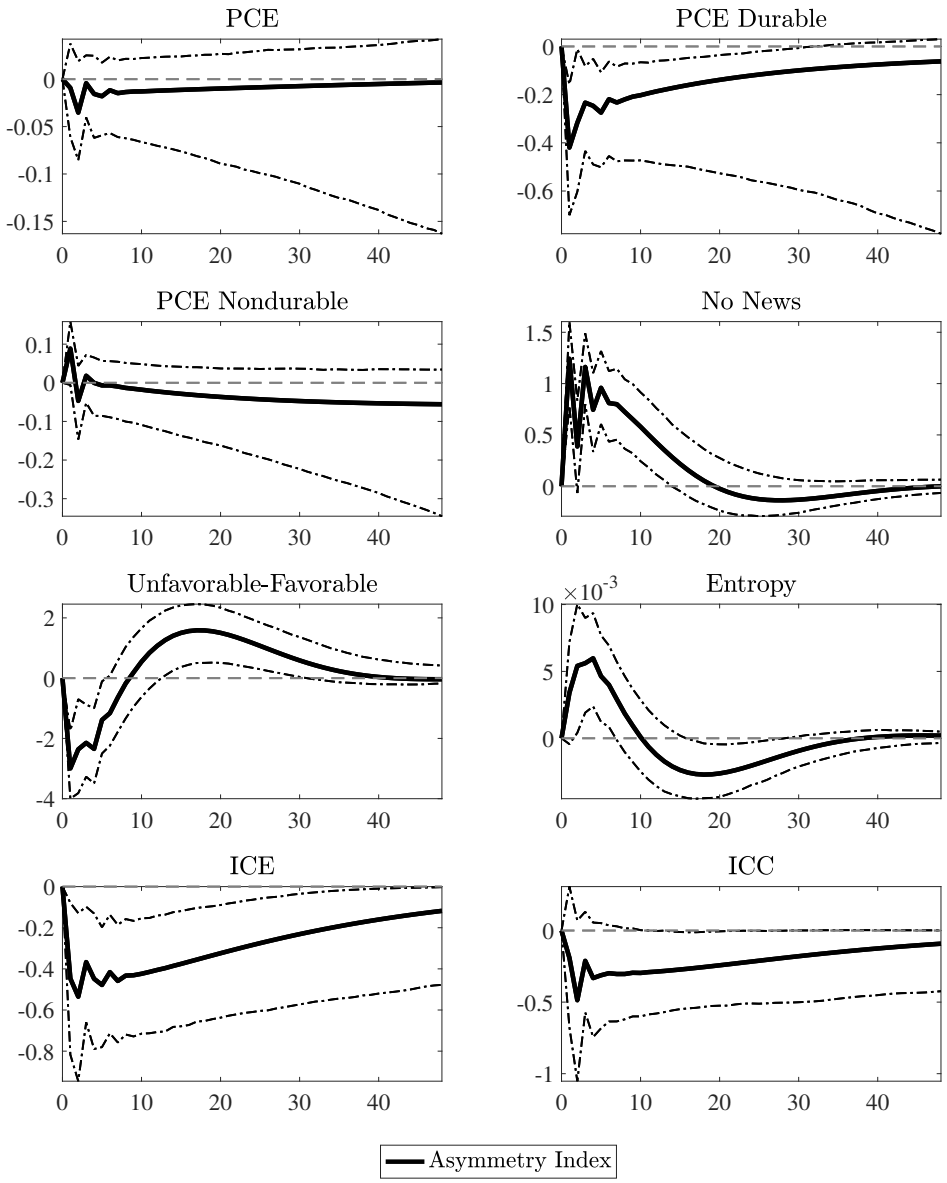


Figure 15: Response of news coverage to unemployment changes - U-tone - Including Industrial Production growth and PCE Inflation

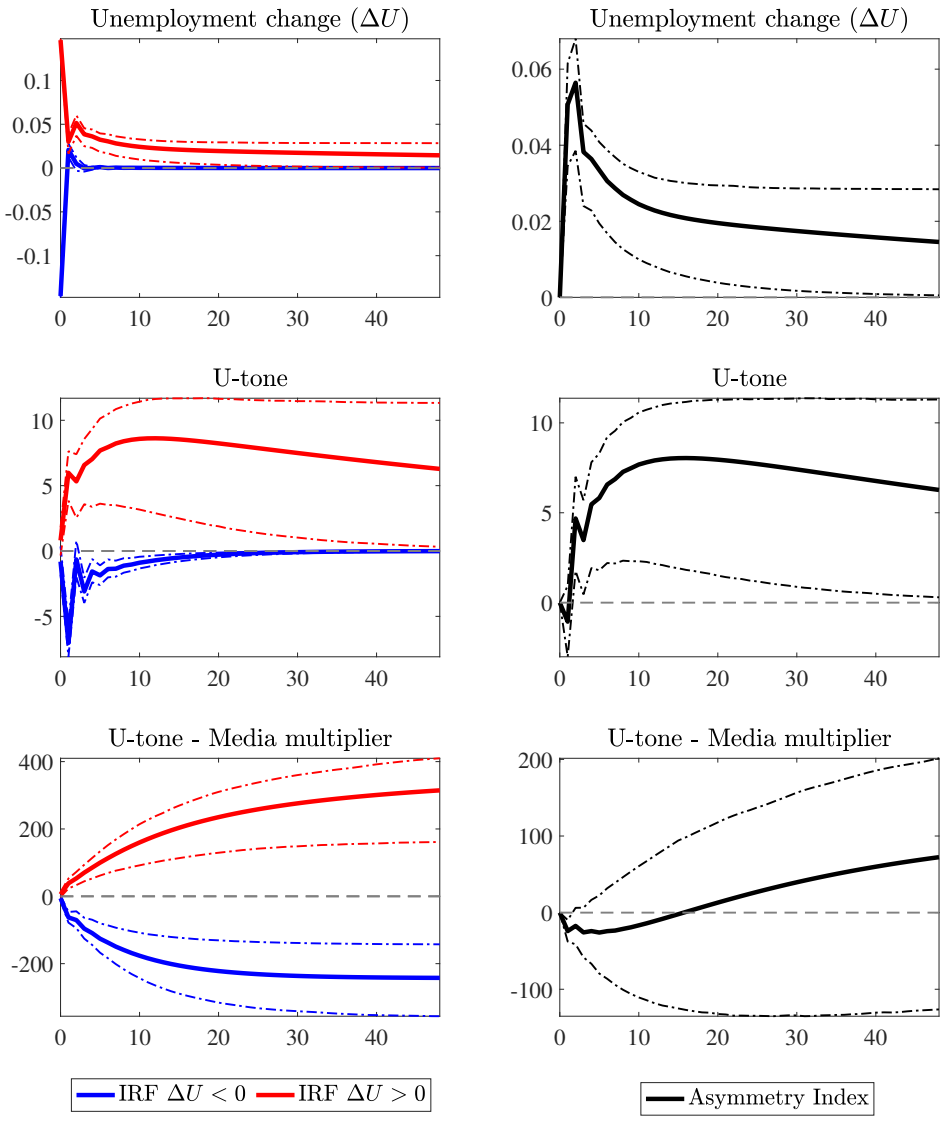


Figure 16: Response of news coverage to unemployment changes - U-total - Including Industrial Production growth and PCE Inflation

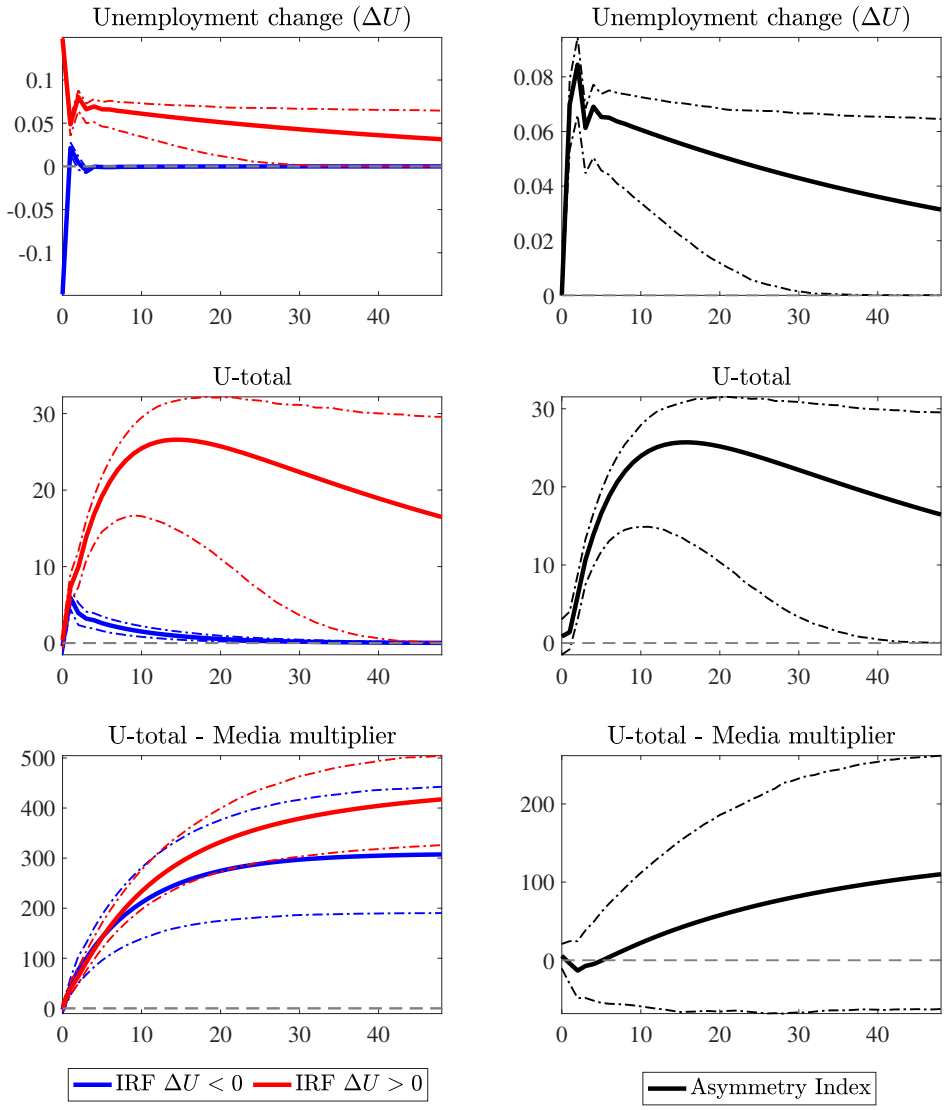


Figure 17: Asymmetric effects of news - IRFs - Including Industrial Production growth and PCE Inflation

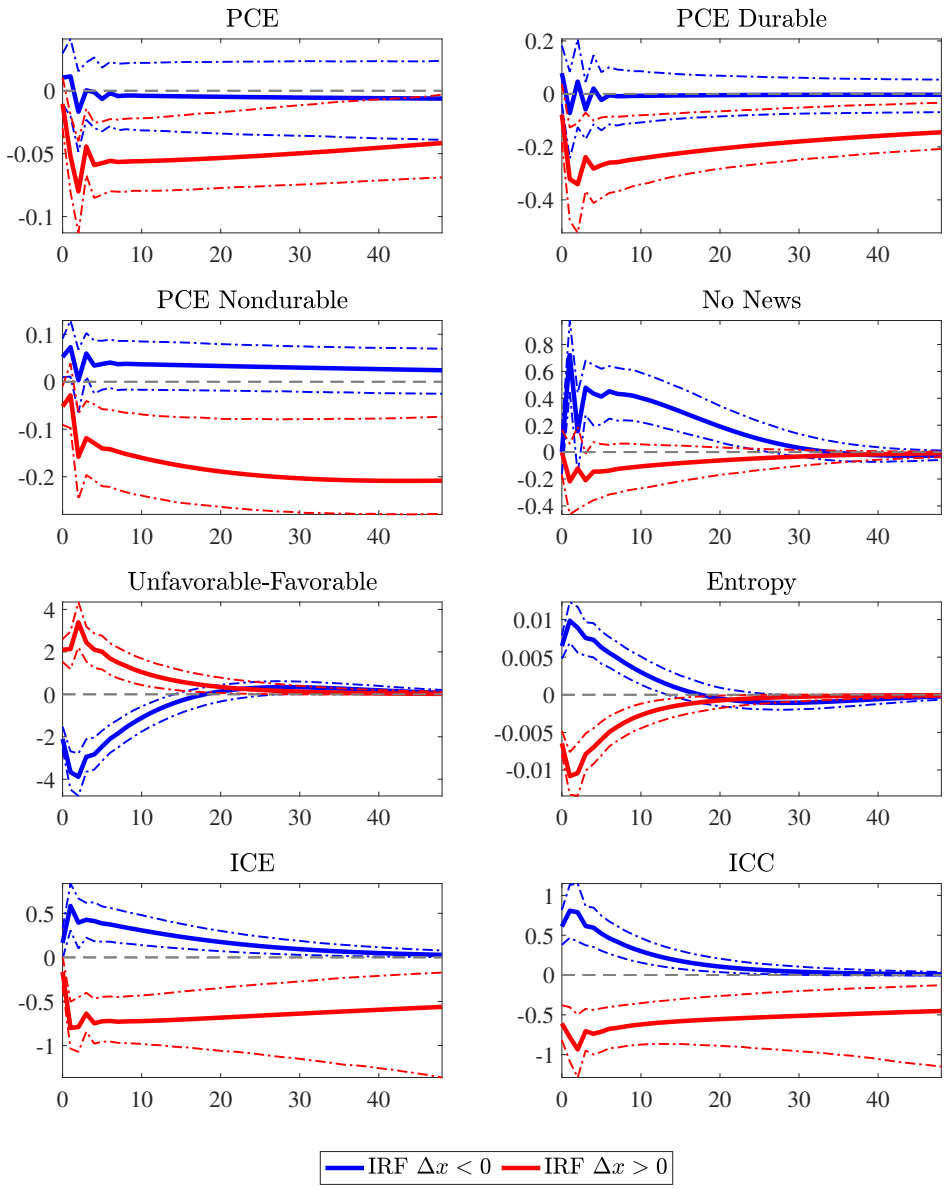


Figure 18: Asymmetric effects of news - Asymmetry Indexes - Including Industrial Production growth and PCE Inflation

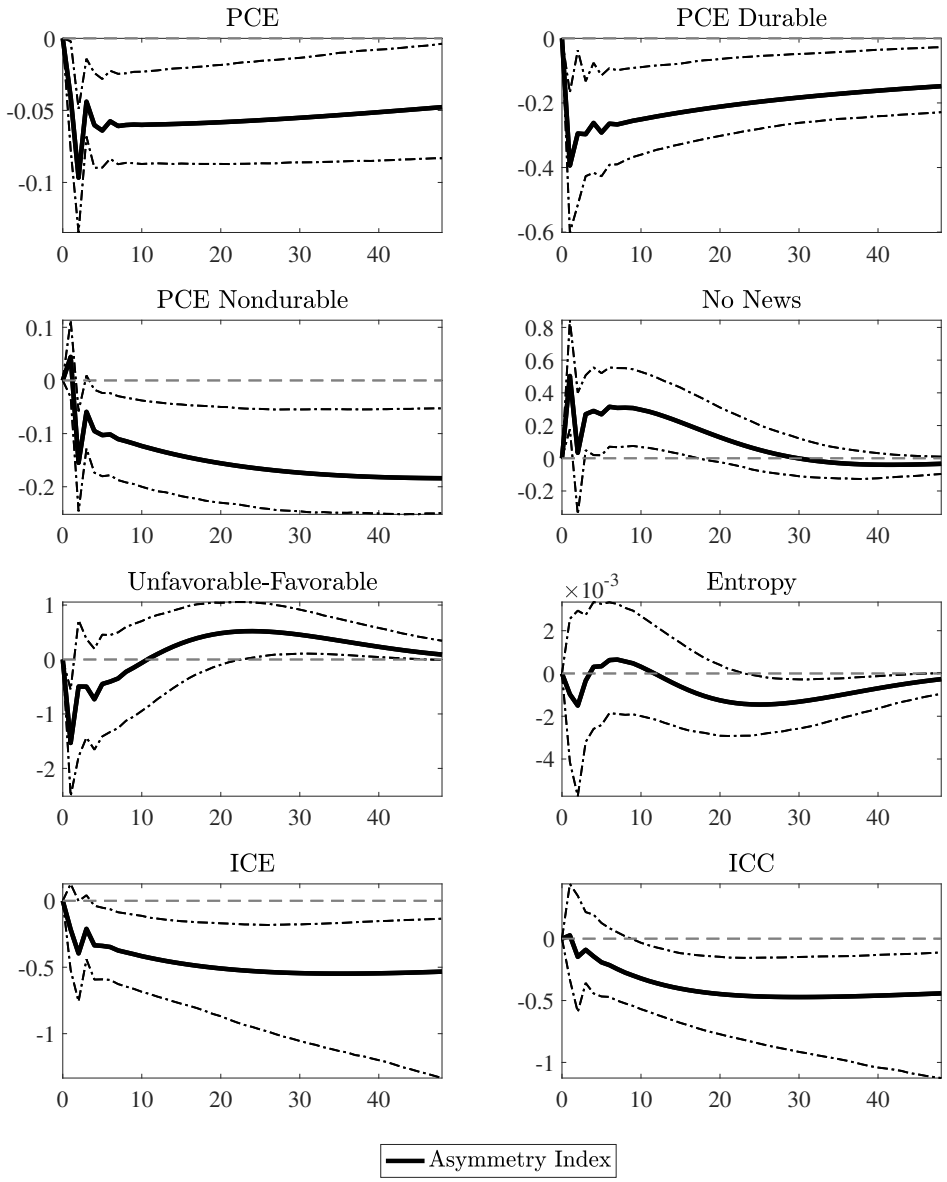


Figure 19: Response of news coverage to unemployment changes - U-tone - Including Stock Prices growth

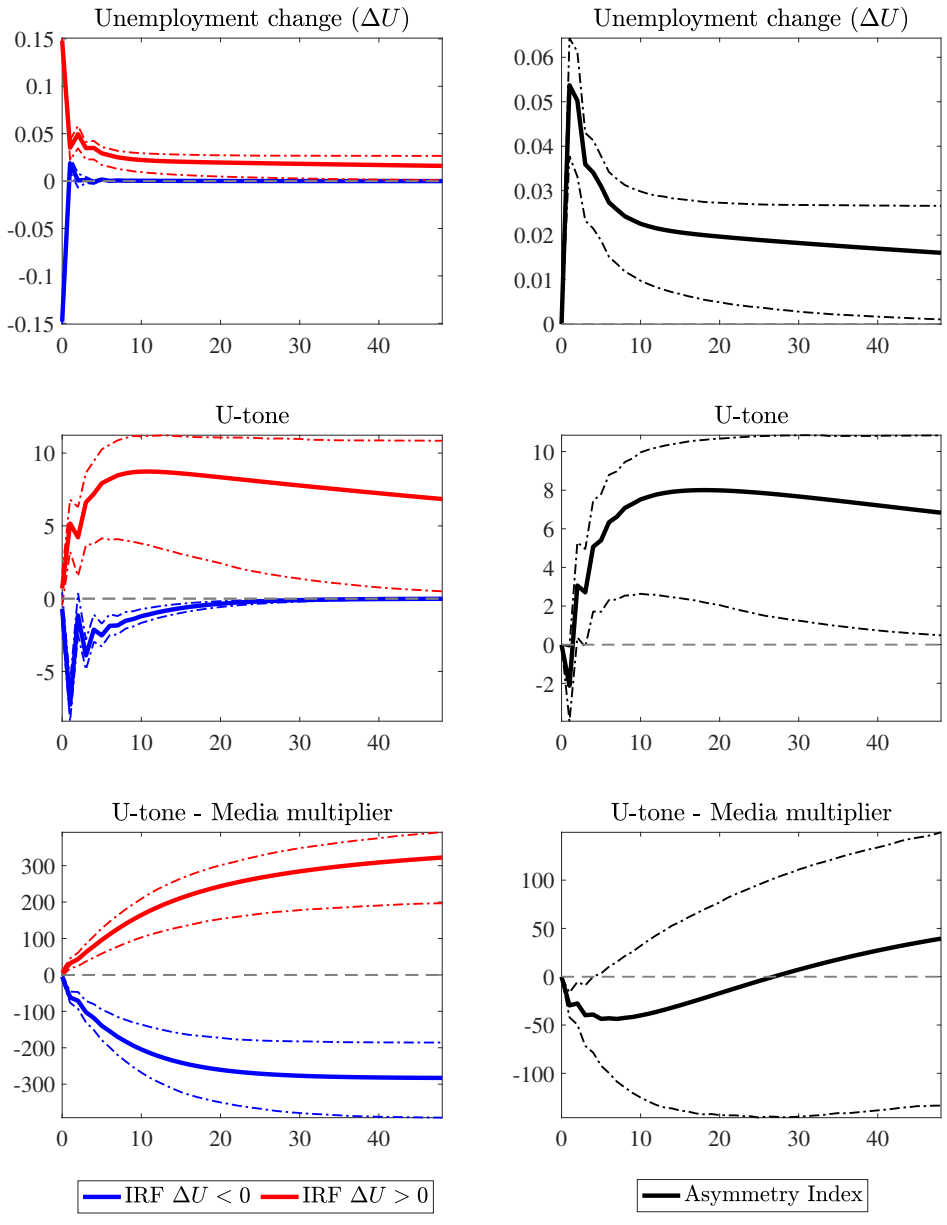


Figure 20: Response of news coverage to unemployment changes - U-total - Including Stock Prices growth

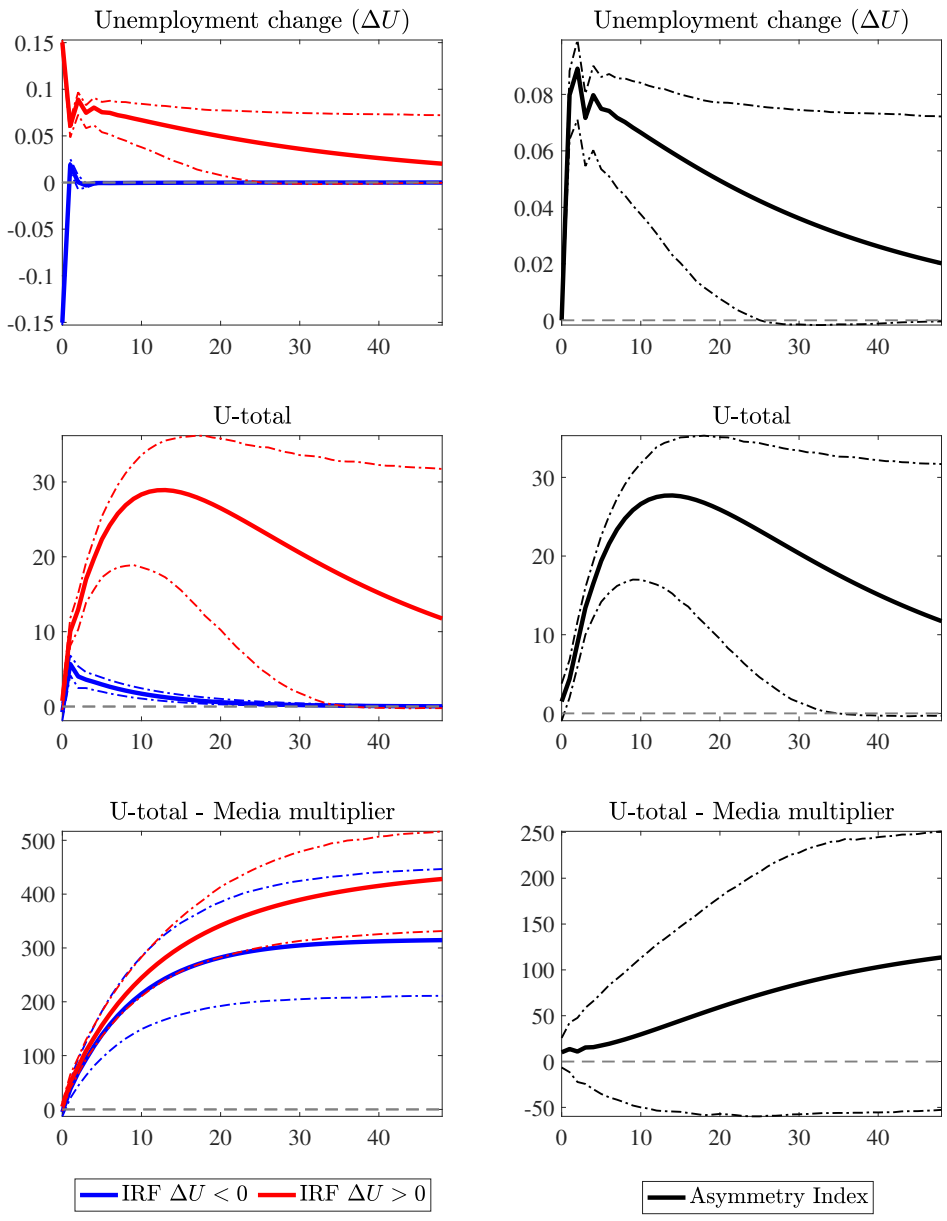


Figure 21: Asymmetric effects of news - IRFs - Including Stock Prices growth

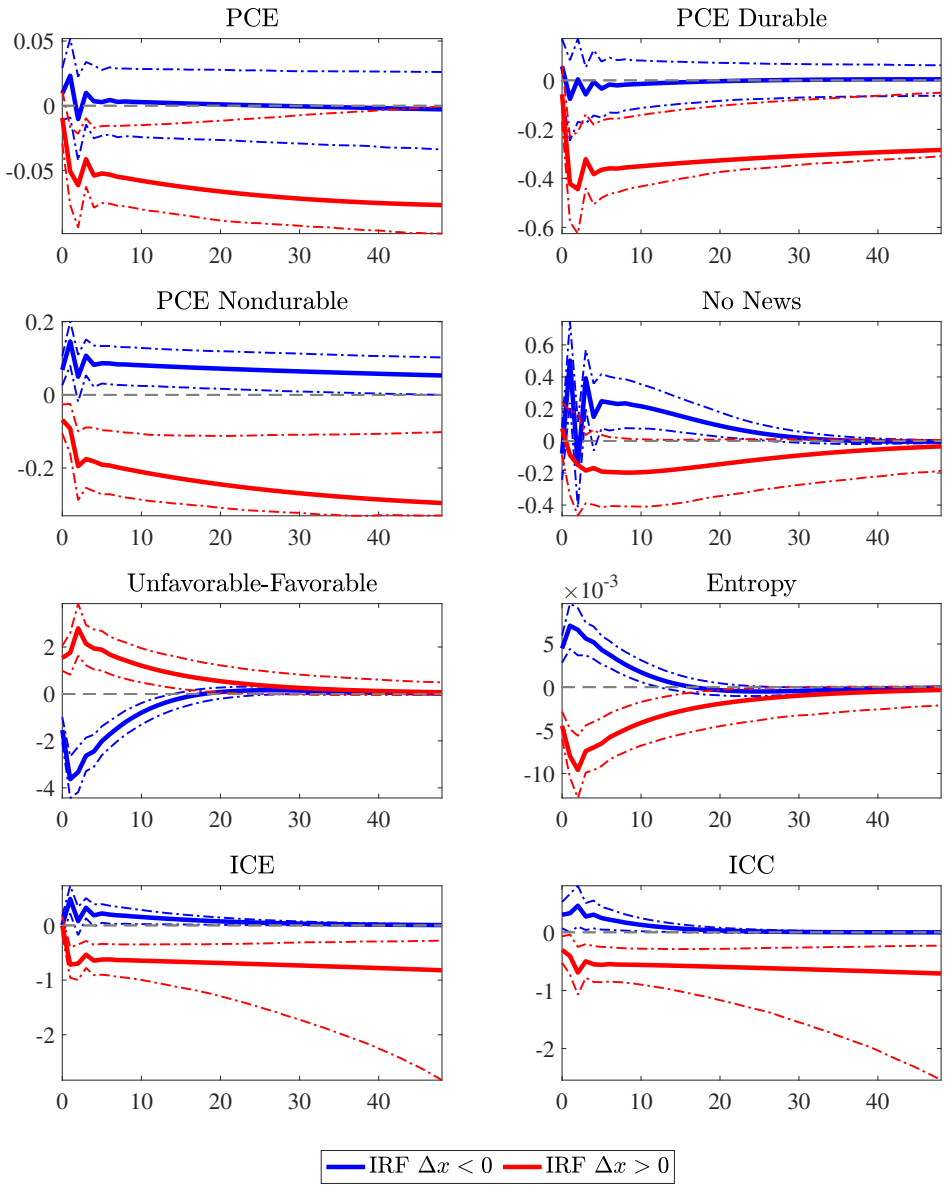


Figure 22: Asymmetric effects of news - Asymmetry Indexes - Including Stock Prices growth