Emoticons Used to React to Inflation News Far More Than Entertaining

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Abstract

This study estimates the effect of inflation rate announcements on media coverage and social media reactions from 2020 to 2023, focusing on the USA and Argentina, representing low and high inflation environments, respectively. By analyzing social media data, we approximate public attention to inflation through reactions to media articles following updates from national statistics agencies. Our findings reveal a significant increase in media coverage of inflation after new data releases. Additionally, social media reactions amplify content related to inflation. Moreover, the results indicate that during periods of greater uncertainty about the inflation rate, agents' attention levels increase significantly. This study provides evidence of social media content's value as an indicator of inflation expectations, particularly in uncertain contexts.

Keywords: inflation, mass media, social network, attention, uncertainty

JEL Classification: E31, E37, E70

1 Introduction

The arrival of new inflation-rate data gives people a new picture of the current state of this macroeconomic phenomenon and can suggest whether and how they should revise their expectations about it. To be sure, the many economic events that occur can overwhelm people trying to make economic decisions. Thus, many people rely on the media, which provides a simplified version of each event (Nimark and Pitschner, 2019). Many people access media reports, and other information channels, through social networks–where they can not only observe in real time which messages are spreading but also promote certain narratives and amplify specific content (Calvo and Aruguete, 2018).

This paper analyzes the relationship between media coverage of inflation from 2020 to 2023 and how much, as well as what kind of, attention people assigned to it following the announcement of new inflation-rate data. Our findings

suggest that social-media content –and in particular emotions expressed therein, using emoticons– is certainly useful for policymakers who are interested in measuring the economic agents' inflation expectations.

Can social media content be used to measure the degree of attention individuals assign to inflation? How much more intense is the degree of attention paid in countries with high inflation rates compared with countries with low inflation? When uncertainty about the dynamics of the inflation rate increases, do people pay more attention to this macroeconomic phenomenon?

To answer these questions, we used social-media-user data to approximate how much attention people pay to the topic of inflation. Our analysis focuses on the USA and Argentina, which have low and high inflation rates, respectively. The degree of attention assigned to the inflation topic is approximated by observing the number of social-media reactions mass-media articles concerning inflation receive after each nation's national statistics agency releases updated inflation data.

Individuals allocate resources to observing the evolution of inflation and forming their beliefs and expectations about it. Cavallo and Perez-Truglia (2017) show that in economies with high inflation rates, people pay a lot more attention to inflation compared with people in low-inflation economies–because the financial cost of ignoring the information is greater. Meanwhile, Macaulay and Song (2023) show that Twitter users express relatively higher pessimism when this phenomenon is above the Federal Reserve's target in the USA.

The results of our study suggest that the arrival of new inflation-rate data significantly impacts how much attention people pay to the topic–but to a much greater degree in Argentina than in the USA. We show that media coverage of the inflation topic increases after the statistical agency publishes new inflation-rate data. In Argentina, the number of articles published on the topic increases by an average of 0.65% in the following 4 days compared with the period before the unveiling of the new data. In the USA, it increases by only 0.50%. Furthermore, when the uncertainty revealed by the new data is greater, this increase in coverage rises to an average of 0.87% in Argentina.

Additionally, the results of our study suggest that social media users amplify content related to new information about the inflation rate, particularly through media reports. Moreover, individuals' reactions are more intense in economies with high inflation rates. In an economy with a low inflation rate, such as the United States, an average increase of 0.50% in comment activation, 0.37% in content sharing, and 0.32% in "likes" is observed. These effects rise when an economy with a high inflation rate, such as Argentina, is considered (0.67%, 0.59%, and 0.49%, respectively). These effects also intensify when uncertainty revealed by the new inflation data is greater.

Furthermore, there is observable impact on the emotions reported by users regarding inflation-rate-related news published by the media–more so in high-inflation environments than low-inflation settings. Specifically, in Argentina,

our study suggests that social-media users employing emoticons to express anger and sadness when encountering news media social posts increases an average of 0.63% following the release of new inflation data, while this increase is around 0.42% for the USA. And when the uncertainty associated with the new inflation data is greater, this increase rises to an average of 1% for Argentina. Additionally, there are statistically significant but smaller effects associated with emotions related to surprise and happiness for people in the USA and Argentina.

This work relates to a literature that considers individuals make endogenous information decisions (Sims, 2003; Woodford, 2009; Mackowiak and Wiederholt, 2009). The allocation of more attention to inflation could indicate optimal responses by individuals to the arrival of news related to the future evolution of inflation. Complementary, this study is also linked to macroeconomic models of sunspots or multiple equilibria (Benhabib and Farmer, 1999; Ascari, 2019). In these models, the macroeconomic dynamic is partly determined by the coordination of behavior and expectations.

Our study indicates that increased public discussion about the inflation rate could result in innovative approaches to coordinating pricing behavior. These innovations are not necessarily captured quickly or accurately by traditional macroeconomic indicators. Thus, social-media content emerges as a valuable indicator of the future evolution of the inflation rate and even of the related levels of uncertainty, especially in high-inflation countries.

Finally, this work relates to a growing literature that uses text as a source of information in economic contexts (Tetlock, 2007; Baker et al., 2016; Thorsrud, 2016, 2020; Altig et al., 2020). Specifically, a considerable number of studies use text-based techniques to characterize inflation. These studies show that content published in the media (Carroll, 2003; Larsen et al., 2021; Kmetz and Wilson, 2022), social media (Denes et al., 2021; Aromi and Llada, 2023; Angelico et al., 2022), and earnings call transcripts (Chava and Zeng, 2022; Albrizio and Vitale Simon, 2023; Gosselin and Taskin, 2023) are valuable sources of information to approximate how much people are paying attention to the inflation rate, their inflation expectations–and to describe the future dynamics of the inflation rate.

However, these studies lack an estimation of the impact inflation-rate data has on individuals' attention levels (Cavallo and Perez-Truglia, 2017; Macaulay and Song, 2023). Having this type of analysis would help understand how individuals' attention levels affect inflation dynamics and how economic policy could influence it. This work utilizes a novel database that enables a combined analysis of media activity and the response of agents to the content they spread on social networks. The contribution of this study can be grouped in the following way. Firstly, it provides evidence supporting informational rigidities over rational expectations with complete information (Coibion and Gorodnichenko, 2015). Secondly, it provides evidence on how information spreads and how users react to new inflation data, considering the attention they allocate to this topic, content activation, participation through comments and shares, as well as the expression of emotions. Lastly, it provides evidence on how agents respond in

situations of higher uncertainty.

After this introduction, the document is organized as follows. In Section 2, the data and methodology are presented. Then, in Section 3, preliminary results are reported. In Section 4, a robustness analysis is conducted. Finally, conclusions are presented in section 5.

2 Data & Methodology

This section presents the sources of information used to estimate the effects of the publication of new inflation rate data on the level of attention assigned by agents to this topic. A database is constructed that mainly combines information on the publication dates of the inflation rate, journalistic articles addressing this topic, and indicators of attention to these articles generated by users on social networks. The data corresponds to Argentina and US for the period 2020-2023. In the following subsections, each source of information is developed in more detail, and the estimation strategy is defined.

2.1 Inflation rate information

The National Institute of Statistics and Censuses of the Argentine Republic (INDEC) is responsible for constructing and publishing the Consumer Price Index (CPI) in Argentina.

The Consumer Price Index (CPI) measures the evolution of prices for a set of goods and services that represent the consumption expenditure of households residing in urban areas. It is used as a measure of the country's inflation.

INDEC is responsible for constructing and publishing the CPI in Argentina. INDEC publishes new inflation rate data every month according to its dissemination calendar[1]. On the 14th day of each month, INDEC releases the CPI data for the previous month. In the case of the US, the US Bureau of Labor Statistics (BLS), around the 12th day of each month, releases the CPI data for the previous month[2].

A database was constructed based on the INDEC and BLS dissemination calendar, containing the publication date and inflation rate data from March 2020 to September 2023, totaling 43 publications.

[1]The dissemination calendar can be consulted at `https://www.indec.gob.ar/indec/web/Calendario-Fecha-0`.

[2]The dissemination calendar can be consulted at `https://www.bls.gov/bls/news-release/cpi.htm#2024`.

2.2 Indicators of attention to the inflation rate

This work aims to estimate media coverage of the topic of inflation by analyzing journalistic articles shared on social media. Furthermore, we will assess the level of attention given to this topic by social media users based on their reactions to the media content.

This information is extracted from Buzzsumo, a platform that provides not only the content published by a specific domain (for example, a media outlet) but also detailed statistics on the activity that such content receives on social media (Facebook, Twitter, Pinterest, YouTube, among others). Among the available metrics are the number of shares, comments, likes, and emotional interactions (such as "angry", "love") received. This data was collected from the Buzzsumo API.[3]

A daily frequency database is constructed using the data available on Buzzsumo. In the case of Argentina, the database contains journalistic articles published by nine prominent media outlets, namely: Ámbito Financiero (ambito.com), Chequeado (chequeado.com), Clarín (clarin.com), Infobae (infobae.com), La Nación (lanacion.com.ar), La Política Online (lapoliticaonline.com), Página 12 (pagina12.com.ar), Tiempo Argentino (tiempoar.com.ar), and TN (tn.com.ar). Regarding the US, the media outlets are: Breitbart (breitbart.com), CNN (cnn.com), Fox News (foxnews.com), NBC News (nbcnews.com), New York Post (nypost.com), New York Times (nytimes.com), One America News (oann.com), Washington Post (washingtonpost.com).

Each article includes information on its publication date, update date, author, title, and URL. Additionally, there is data capturing the article's interaction with users on social media, including the number of shares, comments, and likes, as well as metrics related to emotional reactions such as angry (anger), haha (humor), love, sad (sadness), and wow (surprise or amazement). While there is disaggregated information by social network for these metrics, we will analyze them in aggregate terms. The sample covers the period from February 23, 2020, to September 21, 2023. This work aims to estimate how the arrival of new information on the topic of inflation impacts the level of attention of agents to this topic. Therefore, it is necessary to identify articles that address the topic of interest. Specifically, a journalistic article is considered to address the topic of inflation if it contains the set of keywords related with inflation in the title or URL.[4] Once the articles addressing the topic of inflation are identified, we construct an indicator to capture the level of attention or coverage by the media on the topic of inflation. This indicator is given by:

$$Share_{m,c,t} = \frac{y_{m,c,t}}{Y_{m,c,t}} \tag{1}$$

[3]The API can be consulted at `https://buzzsumo.com/buzzsumo-api/`.

[4]In the case of Argentina, the keywords are "inflac" or "Inflac", while for the US we use "inflat" or "Inflat"

where $Share$ is the indicator of attention to the topic of inflation corresponding to the media outlet m in country c on day t. This indicator is constructed as the ratio between the number of journalistic articles addressing the topic of inflation published by the media outlet m in country c on day t ($y_{m,c,t}$) and the total number of journalistic articles published by the media outlet m in country c on day t ($Y_{m,c,t}$). This specification can be generalized to $Share_{i,m,c,t}$, where each i captures a specific indicator, such as the proportion of times that articles related to inflation topic are shared in relation to the total, the proportion of comments they receive, the proportion of likes they receive, and the proportions corresponding to metrics related to emotions: angry, haha, love, sad, and wow.

2.3 Descriptive statistics

Table 1 displays the descriptive statistics of the main variables for each country. During the analyzed period, the Argentine economy not only reported a high inflation rate, which averaged around 4.9% per month, but also exhibited substantial volatility in terms of this variable (the standard deviation of the inflation rate was 2.5%).

The impact of this variable is reflected in the attention levels of the agents. First, journalistic articles disseminated by the media on the topic of inflation reached, on average, 1% of the total articles published per day. Second, articles covering the topic of inflation were shared, on average, by 0.7%, while those receiving comments and likes were at 0.9%.

In the case of the US, during the analyzed period, the average inflation rate was around 0.4% per month, reaching a maximum level of 1.25% in June 2022. When we examine the variables associated with agents' attention levels, the proportion of articles about the inflation rate published by media outlets, on average, was 0.7%. These articles received an average proportion of shares around 0.3% and 0.4% when considering comments.

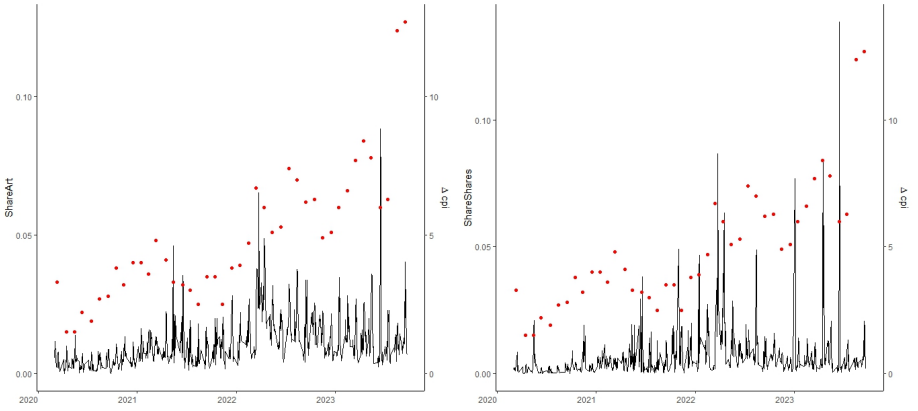
The Figure 1 shows the daily evolution of the proportion of articles addressing the inflation topic and the total number of articles published by the media ($ShareArt$), as well as the proportion of shares received by articles on inflation and the total shares received by all articles ($ShareShares$). Each red point represents the day and the inflation rate data published by each nation's national statistics agency (Δcpi_t). The level of media coverage of this topic reasonably captures the day the new data on this economic variable is published. The correlation between these variables is 0.62 for Argentina and 0.41 for the US. On the other hand, the level of user attention, approximated by the share ratio, does not show a strong association with the publication of new data, despite intensifying on those days (correlation coefficient of 0.36 and 0.39 for Argentina and the US, respectively).

Table 1: Descriptive statistics

The sample period is 2020-2023. $infla$: monthly inflation rate. The data on journalistic articles and user interactions on social media have daily frequency. $Sharei$: indicator of attention to the inflation topic, where i can be articles, shares, comments, likes, angry, haha, love, sad, wow.

Variable	Minimum	Q1	Median	Mean	Q3	Maximum	St. Dev.
				Panel A: Argentina			
Δcpi_t	1.50	3.20	4.05	4.85	6.23	12.70	2.49
ShareArt	0.00	0.00	0.01	0.01	0.01	0.50	0.02
ShareShares	0.00	0.00	0.00	0.01	0.01	0.98	0.03
ShareComments	0.00	0.00	0.00	0.01	0.01	1.00	0.04
ShareLikes	0.00	0.00	0.00	0.01	0.00	1.00	0.04
ShareAngry	0.00	0.00	0.00	0.01	0.01	1.00	0.05
Sharehaha	0.00	0.00	0.00	0.01	0.01	1.00	0.05
ShareLove	0.00	0.00	0.00	0.00	0.00	0.84	0.03
ShareSad	0.00	0.00	0.00	0.01	0.00	1.00	0.05
ShareWow	0.00	0.00	0.00	0.01	0.00	1.00	0.03
				Panel B: US			
Δcpi_t	-0.78	0.20	0.40	0.39	0.55	1.25	0.37
ShareArt	0.00	0.00	0.00	0.01	0.01	0.15	0.01
ShareShares	0.00	0.00	0.00	0.00	0.00	0.28	0.01
ShareComments	0.00	0.00	0.00	0.00	0.00	0.29	0.01
ShareLikes	0.00	0.00	0.00	0.00	0.00	0.39	0.01
ShareAngry	0.00	0.00	0.00	0.01	0.00	0.57	0.02
Sharehaha	0.00	0.00	0.00	0.00	0.00	0.68	0.02
ShareLove	0.00	0.00	0.00	0.00	0.00	0.67	0.01
ShareSad	0.00	0.00	0.00	0.00	0.00	0.44	0.01
ShareWow	0.00	0.00	0.00	0.00	0.00	0.67	0.01

Panel A: Argentina



Panel B: US

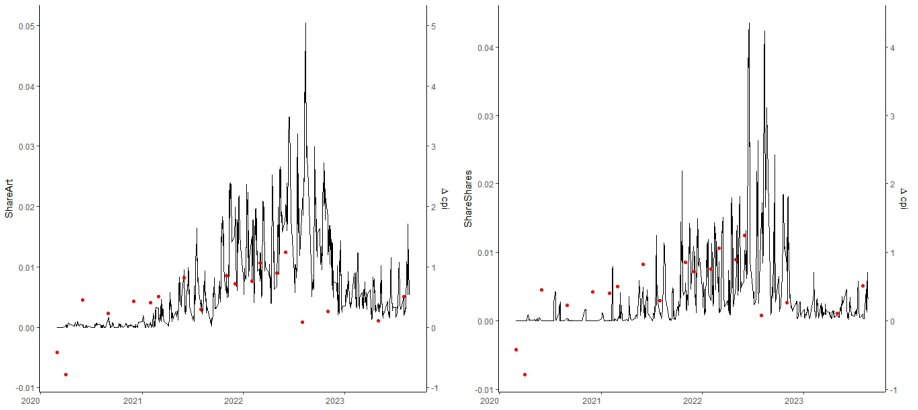


Figure 1: Evolution of media coverage ($ShareArt$), shared rate ($ShareShares$), and inflation rate (Δcpi_t) (in %)

2.4 Empirical strategy

The equation below summarizes the empirical strategy used to estimate the impact of the announcement of a new inflation rate on the attention level of agents:

$$Share_{i,m,c,t} = \alpha_m + \lambda_{ti} + \sum_{\tau=-q}^{-1} \beta_\tau D_{m,c,t} + \sum_{\tau=0}^{n} \delta_\tau D_{m,c,t} + \epsilon_{i,m,c,t} \qquad (2)$$

where the treatment occurs on day 0, i.e., the publication of the new inflation rate by each nation's national statistics agency. It includes q lags or anticipatory effects, and n lags or post-treatment effects. The indicator $D_{m,c,t}$ takes the value of 1 for the day τ before or after the announcement of the new data by each nation's national statistics agency. The coefficients of interest correspond to δ_τ and capture the increase in user's attention levels relative to the reference period (ten days before the nation's national statistics agency announcement). α_m captures fixed effects by media, which allow us to compare the attention levels captured by articles within each media outlet. The terms λ_{ti} capture fixed effects by month and year, aiming to control for possible patterns within the month or year in the attention levels of the agents. ϵ is an error term. Considering that the unit of analysis is the journalistic articles published by media outlets, robust estimation of clustered standard errors is performed at the media level.

3 Results

This section presents the results of estimating the causal effect of national statistics agency inflation rate announcements on agents' attention levels, approximated by media coverage of the topic and users' reactions on social media. The analysis focuses on the USA and Argentina, comparing the effects in both countries, which have low and high inflation rates, respectively. The results show a significant increase in media attention and social media interactions following the inflation announcements.

Additionally, we evaluate whether agents' attention levels increase when the uncertainty revealed by new inflation data is higher. To answer this question, the analysis includes inflation rate forecasts issued by professional forecasters and published monthly by the Central Bank of the Republic of Argentina through the Market Expectations Survey (REM). Uncertainty is measured by the forecast error, defined as the difference between the observed inflation rate and the consensus forecast of analysts. The results indicate that during periods of greater uncertainty about the inflation rate, agents' attention levels increase significantly

Finally, we estimate the effect of the arrival of new information about the inflation rate on media coverage of inflation rate announcements. Through this exercise, we evaluate the impact on a subjective state related to the inflation rate: inflation direction. The results suggest that articles on the inflation rate exhibit a noticeable shift towards increased perspectives of increasing inflation following the release of new data.

3.1 Impact of inflation rate announcements on media coverage and social media reactions

In this section, we present the results from estimating the causal effect of nation's national statistics agency inflation rate announcements on agents' attention levels, approximated by media coverage of the topic and users' reactions to that coverage on social media. Our analysis focuses on the USA and Argentina, which have low and high inflation rates, respectively.

Figure 2 shows the estimation of the model proposed in subsection 2.4, where q and n are set to 10 to define a window around the event ($t = 0$), which is given by the nation's national statistics agency inflation rate announcement. The figure shows the estimated effect on news outlet attention allocated to the inflation topic for Argentina (left panel) and the US (right panel), respectively.

First, we observe that after the arrival of new information regarding the inflation rate, the proportion of journalistic articles addressing this topic shows a discrete jump in both economies. The estimated pre-treatment coefficients are almost in line with zero, with very small standard errors indicating a very precise estimation. Considering the results for Argentina, after the treatment, media coverage immediately increases to 1%. Although the estimate is not as precise as the pre-treatment coefficients, the effect persists. These increases in coverage are statistically significant, and given that the coefficients pre-treatment are essentially zero, it is clear that the post-treatment coefficients are driven by the announcement of the new inflation rate data by INDEC. In the case of the US, the media coverage immediately increases to 0.5% on average after the announcement, whose effect also persist along the following days.

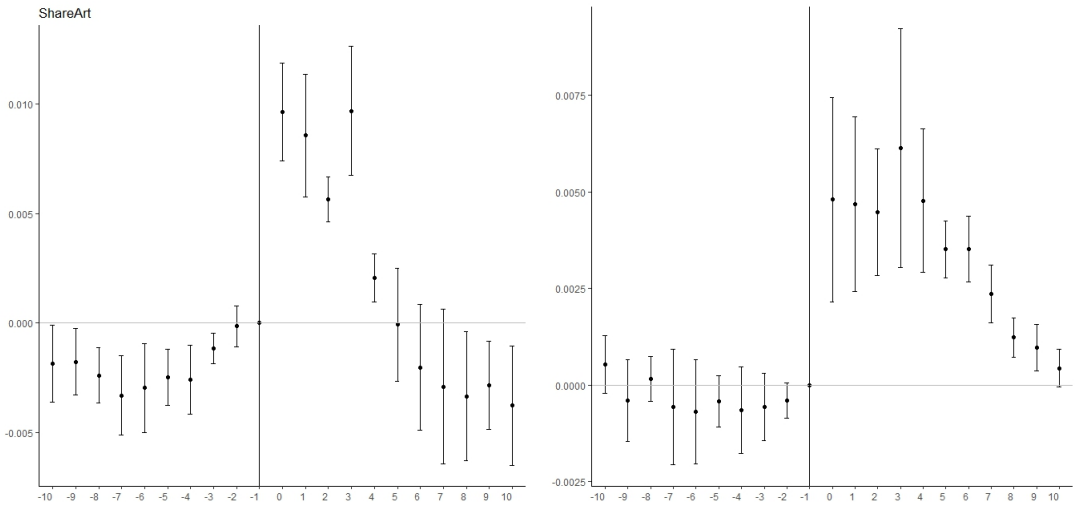


Figure 2: Estimating the impact of the inflation rate announcement on media attention in Argentina (left) and the US (right)

Second, Figure 3 shows that the effect of national statistics agency inflation rate announcements on users' reactions in social media is statistically significant. Considering Argentina, the left column of Figure 3 shows that after the announcement of the new inflation data, the proportion of shared articles on the topic of inflation increases on average by 0.5%, the proportion of articles on the topic of inflation that received comments increases on average by 0.7% and the proportion of articles on the topic of inflation that received likes increases on average by 0.4%. In the case of the US, the right column of Figure 3 shows a statistically and economically significant effect compared to the pre-treatment period. In particular, after the announcement of the new inflation data, we estimated an average increase of 0.3%, 0.4%, and 0.2% in Shares, Comments, and Likes, respectively.

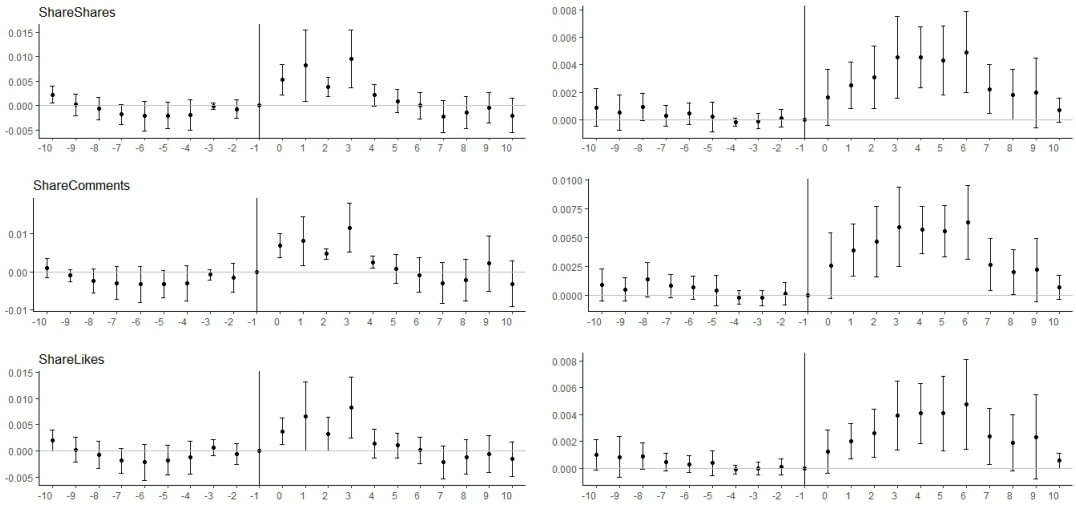


Figure 3: Estimating the impact of the inflation rate announcement on users attention in Argentina (left) and the US (right)

Third, we show that after the announcement of a new inflation rate data, the users react emotionally on social media. Figure 4 shows the estimated results for Argentina. From these results, it can be observed that users express anger and sadness after the arrival of new information about the inflation rate. In particular, after the announcement by INDEC, the proportion of inflation-related articles expressing anger increases by 0.9% on average. Emotions related to laughter increase to a lesser extent, while love and amazement do not show a statistically significant change compared to the pre-treatment phase.

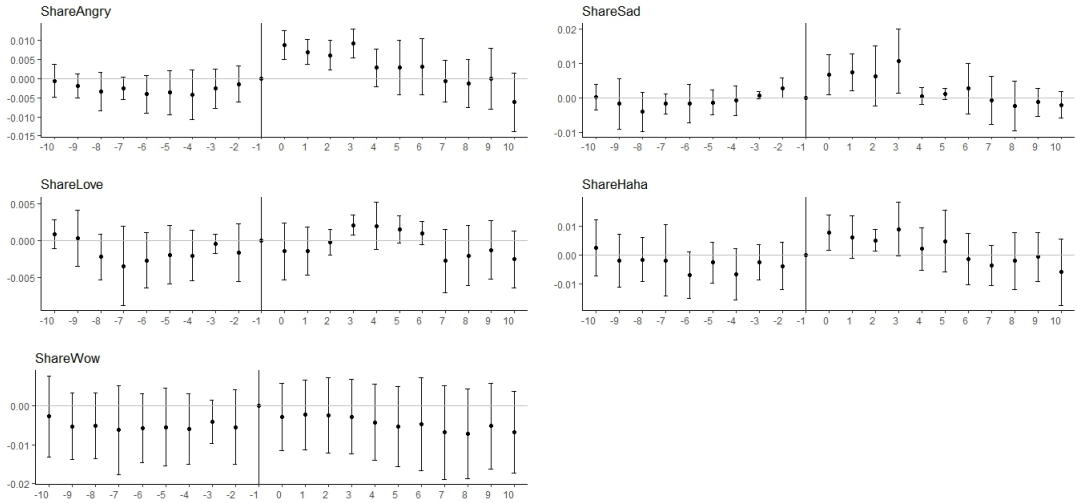


Figure 4: Estimating the impact of the inflation rate announcement on the emotions reported by the users of Argentina

Figure 5 shows the estimated results for the US. The estimated effects are statistically and economically significant. In particular, emotions related to anger and laughter increase more than the rest of the emotions reported.

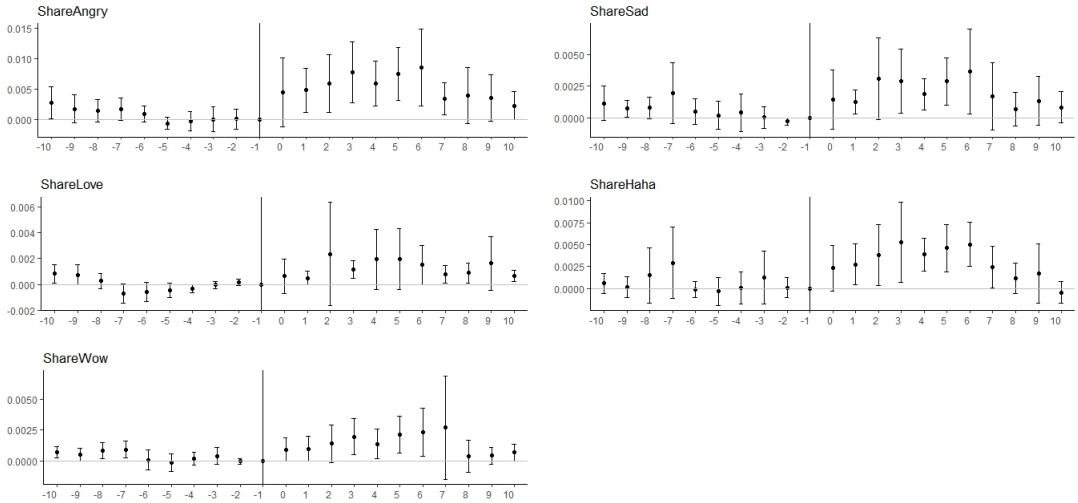


Figure 5: Estimating the impact of the inflation rate announcement on the emotions reported by the users of the US

The regularities reported in this subsection allow us to infer that, following

the arrival of new information about the inflation rate, social media users seem to increase their focus on this topic. The estimated effects are more pronounced in an economy with a high inflation rate.

3.2 Impact of inflation uncertainty on attention levels

Does the level of attention of agents increase when the uncertainty revealed by the new inflation data is higher? To answer this question, we will include in the analysis the forecast of the inflation rate issued by professional forecasters, which the Central Bank of the Republic of Argentina (BCRA) compiles and publishes monthly through the Market Expectations Survey (REM).[5] This exercise not only allows us to answer this question, but also adds robustness to the regularities found in this preliminary work.

Around the 27th and 30th of each month, professional analysts submit their forecasts for several economic variables. In particular, for the inflation rate, the forecasters submit seven forecasts, including the nowcast, i.e. the forecast of the inflation rate for the last month (whose data will be known around the 14th of the following month, when the INDEC publishes the new inflation data) and the forecast for the next 6 months. In other words, for example, between March 26 and March 31, 2020, the BCRA collected forecasts from professional analysts. They made a forecast of the inflation rate for the following months: March (nowcast), April, May, June, July, August and September. Meanwhile, INDEC published the March inflation data on April 16. This difference in days between the release of the professional analysts' forecast and the release of the data is used to approximate the degree of surprise or uncertainty in the new inflation data.

The forecast error is given by the difference between the observed inflation rate and the consensus analyst forecast for this variable. The consensus of analysts is approximated by the median of the forecasts. Continuing with the previous example, the forecast error for March 2020 is 1.3%, which results from comparing the observed inflation for March (3.3%) and the median of the professional analysts' forecasts issued at the end of that month (2.6%). Figure 6 shows the time series and the distribution of forecast errors. As can be seen, this variable shows no obvious asymmetries, indicating that there is no evidence of systematic biases in the forecast errors for the variable of interest over the period analyzed.

[5] REM data can be consulted at `https://www.bcra.gob.ar/PublicacionesEstadisticas/Relevamiento_Expectativas_de_Mercado.asp`.

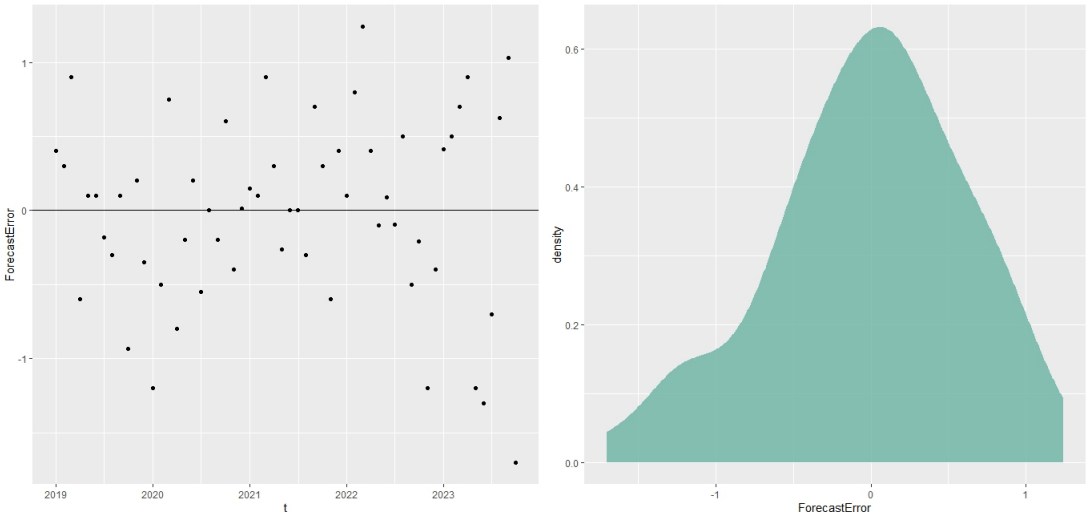


Figure 6: Evolution and distribution of forecast errors

Uncertainty is approximated by those announcements that show a significant gap between the observed inflation rate and the analysts' consensus forecast. Specifically, a dummy variable is constructed that takes the value 1 if

$$|ForecastError_t| >= median(|ForecastError_t|) \tag{3}$$

According to this variable, the INDEC announcement is considered uncertain with respect to the inflation rate if the absolute value of the forecast error differs from the median of its distribution. In total, 23 events are reported. It is expected that during periods of greater uncertainty about the inflation rate, the level of agents' attention will increase.

Figure 7 shows the results of the model proposed in subsection 2.4, where the dummy variable capturing the event takes the value 1 when the announcement of the new inflation rate reveals higher uncertainty. As can be seen, the estimated effects increase with respect to the estimated response when considering the entire sample of releases (see subsection 3.1).

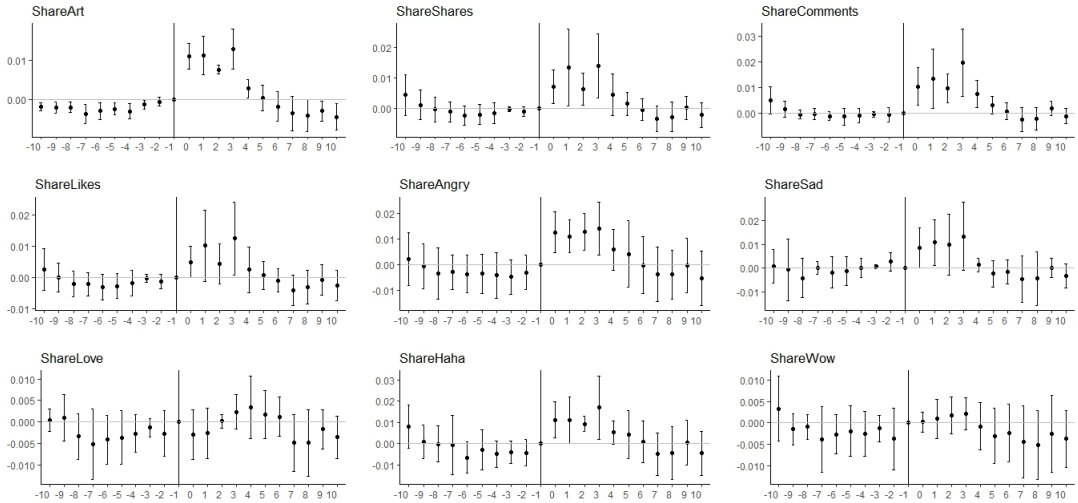


Figure 7: Estimating the impact of the inflation rate announcement on media and user attention during periods of higher uncertainty

These regularities confirmed previous results: the arrival of news information about the inflation rate increase the level of attention of agents, which are higher in an economy with a high inflation rate. In the case of the US, inflation reached decades-high levels during the analyzed period. Throughout this period, households' and firms' inflation expectations were consistently higher than 2%. Considering this, we can regard the period as one of uncertainty regarding the inflation rate in the US.

3.3 Media coverage and subjective states of inflation

How does the mass media cover the topic of inflation when the nation's national statistics agency announces new inflation rate data? In this subsection, we characterize how the mass media cover the inflation topic through the dimension of inflation direction.

Using the daily frequency database constructed from Buzzsumo data, as presented in subsection 2.2, we utilize URLs to gather information. Due to the vast number of mass media articles available, we focus exclusively on those covering the topic of inflation. An article is considered related to inflation if it includes the keywords "inflac" or "Inflac" in the title or URL. Once identified, we collect, if available, the title, the subtitle and the body of each news. This subsection focuses primarily on Argentina, where we have access to detailed information from each mass media article.

Given a corpus of more than 39 thousand of news, we build a set of quantitative indicators to capture a specific dimension about inflation: inflation direc-

tion. This index requires preprocessing of the text. First, We split the corpus in sentences. Second, we split the sentences discussing inflation in individuals words. By this procedure, we build indexes using words within a narrow range of inflation terms. Then, a specific subjective state -such as, inflation direction (increasing-decreasing)- is quantified by the frequency of keywords related to this state within sentences addressing inflation topic, divided by the total number of words in a given article. We use a dictionary approach to define each subjective state, which is defined using a set of keywords.

More specifically, let $i_{m,t}$ represents the number of words related to a subjective state in a sentence addressing inflation topic corresponding to the media outlet m on day t and $n_{m,t}$ represents the total number of words corresponding to the media outlet m on day t . Then, the corresponding value of the inflation subjective state index is given by $iss_{m,t} = i_{m,t}/n_{m,t}$. As mentioned previously, the subjective states considered in this subsection is inflation direction which is the difference between increasing inflation and decreasing inflation. We define increasing inflation though the following list of words: expensive, costly, prohibitive, high, exorbitant, affordable, inaccessible, excessive, abnormal, scam, ruinous, scandalous, out of reach, inconceivable, growth, more expensive, rise, increase, positive, boom, higher.[6] Decreasing inflation is defined using the following list: low, modest, advantageous, discounted, unbeatable, derisory, attractive, bargain, bargain price, affordable, reasonable, competitive, accessible, acceptable, normal, fair, interesting, suitable, negligible, less expensive, decrease, negative, minor.[7]

Figure 8 presents the results of estimating the model described in subsection 2.4, considering the event $(t = 0)$ as the announcement of the inflation rate data by INDEC. Articles on the inflation rate exhibit a noticeable shift towards increased inflation perspectives following the release of new data. The effects are statistically and economically significant.

[6] In Spanish, caro, costoso, prohibitivo, alto, exorbitante, inasequible, inaccesible, excesivo, anormal, estafa, ruinoso, escandaloso, fuera de alcance, inconcebible, crecimiento, más caro, cara, más cara, suba, alza, positiva, aumento, auge, mayor.

[7] In Spanish, bajo, modesto, ventajoso, descontado, imbatible, irrisorio, atractivo, oferta, precio de oferta, atractiva, promoción, asequible, razonable, competitivo, accesible, aceptable, normal, justo, interesante, adecuado, insignificante, menos caro, baja, caída, negativa, disminución, descenso, merma, menor.

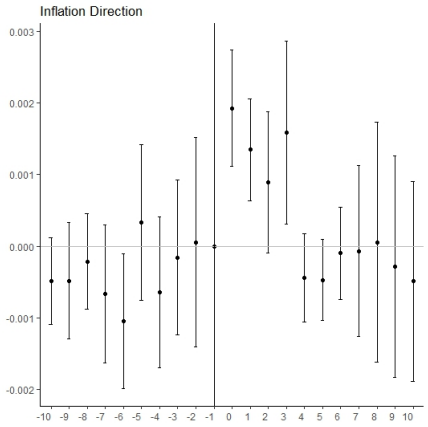


Figure 8: Estimating the impact on media cover of the inflation rate announcement

4 Robustness Analysis

In this section, a series of robustness exercises are conducted to assess how sensitive the regularities reported in the previous section are to changes in the model specification. First, a placebo exercise is performed by estimating the causal effect of nation's national statistics agency inflation rate announcements on agents' attention to non-inflation topics (e.g., politics, culture). In this case, given that we are working with daily frequency information, it is expected that there will be no systematic effect on agents' attention levels to other topics following the arrival of information related to the inflation rate. Second, the effect of the arrival of new inflation information on agents' attention levels during periods of low uncertainty is evaluated. In this case, positive results would support the hypothesis that agents make endogenous information choices and reduce information rigidity during uncertain periods.

Figure 9 shows the results obtained by estimating the model proposed in subsection 2.4, considering the event ($t = 0$) as the announcement of the inflation rate data by INDEC. However, the attention levels of the agents correspond to the journalistic articles distributed on the political topic[8] and culture[9]. As we

[8] An article is considered to be on the political topic if it contains the word "polític", "congreso", "gobierno", "oposición", "presidente", "diputad" o "senado" (in English "politic", "congress", "government", "opposition", "president", "deputy", or "senate", respectively) in the title or URL.

[9] In this case, an article is considered to be about culture if it contains the word "arte", "tradición", "cultura", "historia", "religión", "costumbres", "literatura", "música", "danza", "arquitectura", "gastronomía", "folclore", "museo", "teatro", "cine", "moda" (in English, "art", "tradition", "culture", "history", "religion", "customs", "literature", "music", "dance", "architecture", "gastronomy", "folklore", "museum", "theater", "cinema", "fashion").

can see, in both cases there is no statistically significant change in the level of attention of the agents to topics other than the inflation rate after the arrival of information about this phenomenon.

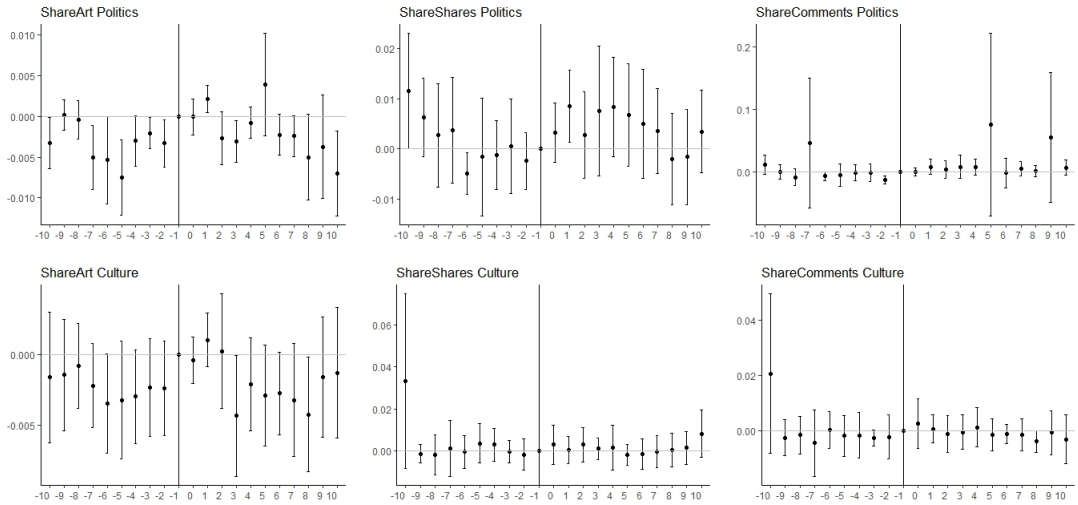


Figure 9: Estimation of the impact of the inflation rate announcement on media and user attention to political and cultural issues in Argentina

In the case of the US, the Figure 10 shows that agents' attention reactions do not seem to increase when mass-media articles are about politics and culture.[10]

[10]An article is about politics if it contains keywords such as "democratic", "republican", "congress", "senate", "presiden", "supreme", "representatives", while an article is about culture if it contains keywords like "art", "diversity", "culture", "television", "literature", "fashion", "cuisine", "sports", "language", "traditions", "festivals", "religion".

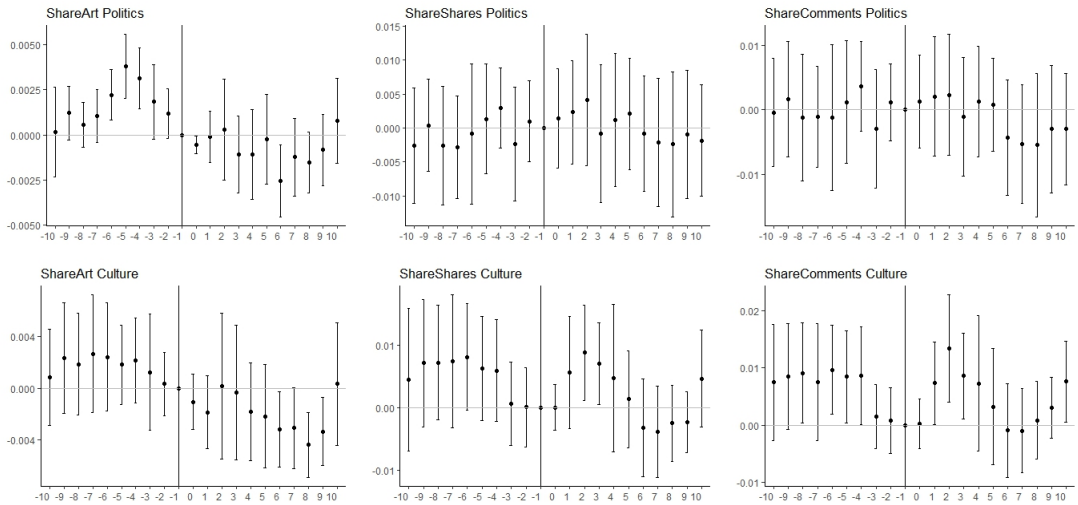


Figure 10: Estimation of the impact of the inflation rate announcement on media and user attention to political and cultural issues in the US

Finally, an estimation of the model presented in section 2.4 is performed, but in this case the event ($t = 0$) is considered if the published inflation rate data by INDEC show a low uncertainty around this phenomenon. In this case, the announcement is considered to reflect low uncertainty if the absolute value of the forecast error is below the median of its distribution. Figure 11 shows the estimated effect of the arrival of new information on the inflation rate on agents' attention levels during periods of low uncertainty. On the one hand, while there is a statistically significant effect on media coverage, the magnitude of this discrete jump is smaller than that shown in Figure 2. On the other hand, there is no statistically significant change in users' attention levels compared to the pre-treatment period during periods of low uncertainty.

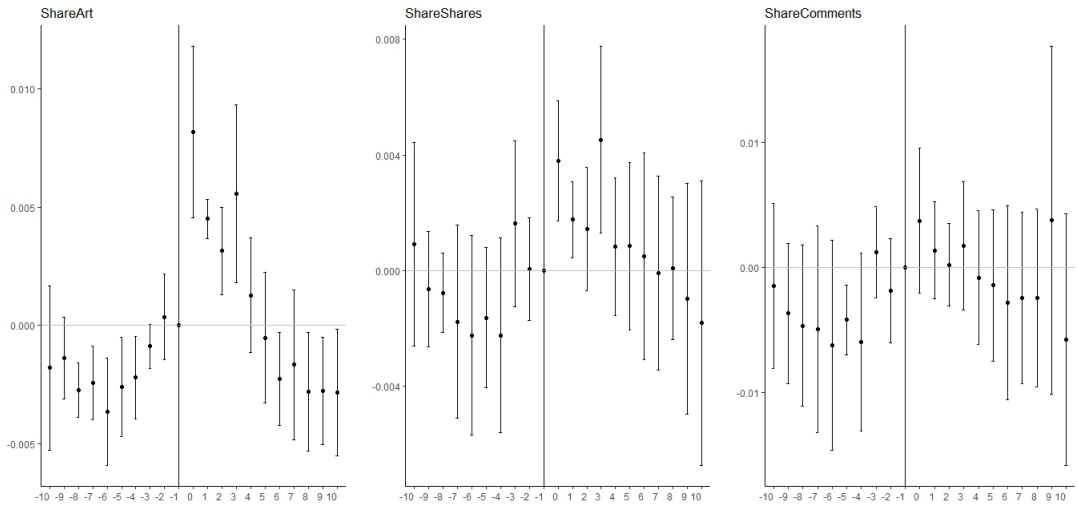


Figure 11: Estimating the impact of the inflation rate announcement on media and user attention during periods of low uncertainty

5 Conclusions

This study estimate the effect of national statistics agency inflation rate announcements on agents' attention level. We used social-media-user data to approximate how much attention people pay to the topic of inflation. Our analysis focuses on the USA and Argentina, which have low and high inflation rates, respectively. The results suggest that both the social-media users respond significantly to the arrival of new information about the inflation rate. The increased media coverage and social media amplification, especially during periods of greater uncertainty, indicate that agents' attention is sensitive to relevant economic information. These findings not only support the existence of informational rigidities rather than rational expectations with perfect information, but also highlight the importance of considering agents' attention when analyzing the effects of monetary policy and economic developments.

There are several directions in which this work could be extended. First, it would be interesting to assess how agents update their inflation expectations with the arrival of new information about this phenomenon. This analysis would provide a deeper understanding of the dynamics of expectation formation in the context of high inflation. Second, one could assess whether media coverage of inflation is heterogeneous. This would shed light on possible biases in the coverage. Third, since this paper focuses on an economy with a high inflation rate, a possible extension would be to assess whether the documented regularities persist in economies with moderate or low inflation during periods with less uncertainty around the inflation rate, as considered in this paper.

References

Albrizio, s., D. A. G. and Vitale Simon, P. (2023). Mining the gap: Extracting firms' inflation expectations from earnings calls. Imf working papers wp/23/202, International Monetary Fund.

Altig, D., Baker, S., Barrero, J. M., Bloom, N., Bunn, P., Chen, S., Davis, S. J., Leather, J., Meyer, B., M. E., Mizen, P., Parker, N., Renault, T., Smietanka, P., and Thwaites, G. (2020). Economic uncertainty before and during the covid-19 pandemic. *Journal of Public Economics*, 191.

Angelico, C., Marcucci, J., Miccoli, M., and Quarta, F. (2022). Can we measure inflation expectations using twitter? *Journal of Econometrics*, 228(2):259–277.

Aromi, D. J. and Llada, M. (2023). Forecasting inflation with twitter. *Económica*, 031(69).

Ascari, G., B. P. y. L. H. F. (2019). Walk on the wild side: temporarily unstable paths and multiplicative sunspots. *American Economic Review*, 5(42):123–134.

Baker, S. R., Bloom, N., and Davis, S. J. (2016). Measuring economic policy uncertainty. *The quarterly journal of economics*, 131(4):1593–1636.

Benhabib, J. and Farmer, R. (1999). Chapter 6 indeterminacy and sunspots in macroeconomics. In *Handbook of Macroeconomics*, volume 1, pages 387 – 448. Elsevier.

Calvo, R. and Aruguete, N. (2018). Tarifazo. medios tradicionales y fusión de agenda en redes sociales. *Inmediación de la comunicación*, 1(13):189–213.

Carroll, C. D. (2003). Macroeconomic expectations of households and professional forecasters. *The Quarterly Journal of Economics*, 118(1):269–298.

Cavallo, A., C. G. and Perez-Truglia, R. (2017). Inflation expectations, learning, and supermarket prices: Evidence from survey experiments. *American Economic Journal*, 3(9):1–35.

Chava, S., D. W. S. A. and Zeng, L. (2022). Measuring firm-level inflation exposure: A deep learning approach. 4228332, SSRN.

Coibion, O. and Gorodnichenko, Y. (2015). Information rigidity and the expectations formation process: A simple framework and new facts. *American Economic Review*, 105(8):2644–78.

Denes, J., Lestrade, A., and Richardet, L. (2021). Using twitter data to measure inflation perception. Working papers, Irving Fisher Committee on Central Bank Statistics.

Gosselin, M. and Taskin, T. (2023). What can earnings calls tell us about the output gap and inflation in canada? Bank of canada staff discussion papers., Bank of Canada.

Kmetz, A., S. A. H. and Wilson, D. J. (2022). Can the news drive inflation expectations? Frbsf economic letter, Federal Reserve Bank of San Francisco.

Larsen, V. H., Thorsrud, L. A., and Zhulanova, J. (2021). News-driven inflation expectations and information rigidities. *Journal of Monetary Economics*, 117:507–520.

Macaulay, A. and Song, W. (2023). News media, inflation, and sentiment. *AEA Papers and Proceedings*, 113:172–76.

Mackowiak, B. and Wiederholt, M. (2009). Optimal sticky prices under rational inattention. *American Economic Review*, 99(3):769–803.

Nimark, K. P. and Pitschner, S. (2019). News media and delegated information choice. *Journal of Economic Theory*, (181):160–196.

Sims, C. (2003). Implications of rational inattention. *Journal of Monetary Economics*, 50(3):665–690.

Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of finance*, 62(3):1139–1168.

Thorsrud, L. A. (2016). Nowcasting using news topics, big data versus big bank. Working Papers 20, Norges Bank.

Thorsrud, L. A. (2020). Words are the new numbers: a newsy coincident index of the business cycle. *Journal of Business & Economic Statistics*, 38(2):393–409.

Woodford, M. (2009). Information-constrained state-dependent pricing. *Journal of Monetary Economics*, S(56):100–124.