

Inflation news coverage and the impact on inflation expectations across demographic groups

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Abstract

This paper analyzes how news about inflation influences the accuracy of consumers' inflation forecasts using US micro data. The results show that a rise in the number of articles concerning inflation improves the accuracy on average but not for all demographic groups. An increase of one article a day improves the accuracy of consumers' inflation forecast by 0.1 percentage points, but this also does not hold for all groups. The speed of adjustment between experts' and consumers' inflation forecasts is higher if more articles about inflation are printed in newspapers.

Keywords: Inflation expectations; media impact; rational inattention

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1 Introduction

Inflation expectations are an important part of many economic models. The outcome of the models depends essentially on the assumption about the inflation expectations. It has been shown empirically for different countries that consumers form their inflation expectations by frequently adapting the inflation forecasts of experts.¹ It is reasonable to assume that information about experts' inflation forecasts are passed through the mass media.

This paper analyzes the influence of the amount of inflation related news in American newspapers on the differences between the inflation expectations of consumers and experts. Until now, the approach in the literature studies how the amount of news influences the inflation forecast accuracy of the *representative consumer*.² To extend the existing analysis and to check for the robustness of the results, the analysis in this paper is done for the *representative American consumer* and for *different subgroups*. The amount of news in the literature is calculated by an index variable on a yearly basis. This implies that the news in the last quarter of a year should influence the inflation forecast in the first quarter. This does not seem to be very realistic. To reduce the time gap between news and inflation expectation the analysis in this paper is done on a quarterly basis. Unfortunately it is not possible to make the analysis on a monthly basis because data for the inflation forecast of professionals is only available on a quarter basis (Cf. chapter 3). So the smallest possible time unit is quarterly.

A further extension of the exciting literature is that news is represented in this paper not only by an index news variable but also by the absolute amount of news on a quarterly basis. Furthermore the influence of news in the actual period and the news from the previous period is analyzed.

The results show that the consumers' inflation forecast of the representative American consumer is closer to the experts' forecast if more news about inflation is printed in newspapers. If news has an influence on the forecast accuracy of consumers, the influence is negative. The gap between consumers'

¹Cf. Carroll (2003) and Döpke, Dovern, Fritsche, and Slacalek (2008)

²Cf. Carroll (2003)

and experts' inflation forecasts is reduced by about 0.1 percentage points if one more newspaper article is published each day. However these results also do not hold for all demographic groups. The findings are only robust for the representative consumer, women, and individuals with medium education as well as those with low or middle incomes. They can not be verified for men, low and highly educated, and high income individuals. It is also shown that the speed of adjustment from consumers forecast to expert forecast is higher for all consumer groups if there is more inflation news available.

The remainder of the paper is organized as follows. Section 2 deals with the impact of news on inflation forecasts that would be expected theoretically. Section 3 describes the data used in the analysis. In Section 4 empirical results are presented. Finally Section 5 concludes.

2 Theoretical impact of news on inflation forecasts

The argumentation in this paper follows the idea of rational inattention and inattentiveness (Cf. Sims (2003), Mankiw and Reis (2007)). The basic idea is that collecting and processing information that is needed for a rational inflation forecast is costly for economic agents. Therefore it is rational not to take all available information into account when forming inflation forecasts.

This is to say that consumers need information about economic variables and the economic model to forecast the inflation over the next period. To get information about the future inflation they have to spend time reading newspapers, watching news on TV, talking to their colleagues, their friends, or neighbors. Therefore the collection of information about future inflation is costly. The processing of information is also costly because cognitive abilities of economic agents are limited.³

On the other hand a good knowledge about future inflation spends utility as well. The better the knowledge of an individual the lower the deviation of the predicted inflation and the realized inflation. The better the predicted

³Cf. Mackowiak and Wiederholt (2007)

inflation the higher utility because utility maximization from individuals is based on their predicted inflation in many models. Therefore an individual should collect and process information as long as the marginal costs are lower than the marginal benefit. This also implies that the forecast of an individual should not be rational in the mathematical sense. To form an inflation forecast that is rational in the mathematical sense the forecast has to be equal to the mathematical expectation. To generate such a forecast, all available information has to be collected and processed. With costly information acquisition and processing however, a level of inattention and therefore a deviation of the inflation forecasts from the realized inflation in the future is rational.

In this paper the term "rational forecast" is not used in its mathematical sense but for the forecast of professionals, presumably the best available forecast. As explained above, it is not rational for an individual to deal all day with collecting and processing information to get a mathematically rational inflation forecast. But if individuals expect that professional forecasters do a better forecast compared to themselves (because experts actually deal the whole day with inflation forecasts), then they should adopt the forecasts of professionals.

Consumers receive information about the expert view via the mass media. In further analysis it is assumed that the inflation forecasts in the media represent the expert forecasts. But there are still costs for the consumer to get this information by spending time reading the newspaper, finding the article about inflation and keeping the inflation forecast of experts in mind. Presumably, consumers therefore do not read and remember the forecasts of experts every period. Consequently, they take parts of the expert forecasts into account when forming inflation expectations. Beside the expert forecasts the consumer forecasts show some autoregressive behavior. Several researchers (inter alia Carroll (2003) and Döpke, Doornik, Fritsche, and Slacalek (2008)) have shown empirically that the macroeconomic variables that influence the inflation expectations of consumers are the expert forecasts and their own inflation forecast from one period ago. The common result is that

consumers' inflation expectation can be described by the equation:

$$\pi_t^C = \beta_1 \pi_t^E + \beta_2 \pi_{t-1}^C + \epsilon_t$$

Where π_t^C represents the inflation forecasts of consumers and π_t^E represents the inflation forecasts of experts. The estimated coefficient of the literature mentioned above for β_1 is about 0.25 and for β_2 is about 0.75 if the data is measured on a quarterly basis. This can be interpreted that once a year the consumers have rational inflation forecasts. This indicates that once a year consumers update their inflation forecasts by the experts' inflation forecasts. It implies on the other hand that consumers' forecasts deviate from experts' forecasts from a macroeconomic perspective.

The difference between consumers' forecasts and experts' forecasts is the variable of interest in this analysis. The deviation can be calculated by absolute differences or squared differences. The analysis is done for both deviations. As the results are quantitatively the same, only the results of the absolute deviation

$$Deviation_t = |\pi_t^E - \pi_t^C|$$

are presented.⁴ Where π_t^E is again the inflation forecast of experts made in period t and π_t^C is the inflation forecast of consumers made in period t .

As explained above the level of deviation should reflect the point that the marginal costs are equal to the marginal benefit of information for the economic agent if the deviation is due to rational inattention. If the costs of information are getting lower because of an exogenous event, the degree of deviation should fall, *ceteris paribus*. This could be the case if professional forecasts are more available to the economic agents. If it is assumed that the inflation forecasts in newspapers reflect the forecasts of professionals, the forecast of professionals is more available to the consumers the more often articles concerning inflation are printed. Consumers do not have to invest much time to find the experts' forecasts in the business section because they may be printed on the front page. Therefore the hypothesis whether the

⁴Results concerning the squared differences are available by the author on request.

level of deviation falls if more inflation news is available is checked by the following equation:

$$Deviation_t = \alpha_1 + \alpha_2 NEWS_t + \varepsilon_t$$

Where the variable $NEWS_t$ represents the amount of articles concerning inflation. Carroll (2003) analyzes this hypothesis and finds the estimator of the constant $\widehat{\alpha}_1$ to be significantly positive and that the amount of news has a negative influence on the level of deviation for the representative American consumer. This paper investigates if these results still hold for a longer time horizon and for demographic groups. These groups are constructed using gender, education (low; middle; high), age (under 34 years; 35-53 years; above 53 years), income (first; second; third; fourth quartile), region (West; North Central; Northeast; South), and parenthood (Yes; No).⁵ The results reveal substantial differences across subgroups.

3 Data

To answer the question if and how news about inflation influences the deviation between consumers' and experts' forecasts three variables are needed: A variable for the amount of news, the inflation forecasts of consumers, and the inflation forecasts of experts. For the amount of news about inflation an index is calculated following Carroll (2003). The news index in Carroll's paper and this paper is based on the amount of inflation news in the *New York Times* and the *Washington Post*. All articles from these two newspapers are available via the database *Lexis Nexis* from January 1980 onwards

⁵Individuals with no high school diploma belong to the low educated group, individuals with high school diploma but without a college degree belong to the middle educated group, and individuals with a college degree belong to the high educated group. States by region: Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont. North Central: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin. South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia. West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

on a daily basis. Both these newspapers are the only newspapers that are available from 1980 onwards. No other newspaper is available for a longer time horizon. It is searched for articles that include the word root "inflation". Thus it is searched for "inflation" and for example "inflationary" as well. Carroll counts the number of inflation news articles in each newspaper for each year. He calculates a news index by dividing the amount of inflation news articles in each year by the maximum number of news articles in any year. This index is calculated for both newspapers. Finally, both individual indices are aggregated into one news index by calculating the mean. This index is used for his analysis.

This means that Carroll uses the amount of inflation news in the total year to explain the inflation expectations of consumers in each quarter of the same year. This implicitly assumes that the amount of news in the end of the year influences also the expectations of the consumers in the first quarter. This seems to be unrealistic. To make the analysis more realistic and narrow the time gap between the news and the forecast the news index in this paper is calculated on a quarterly basis. The amount of inflation news is counted for each quarter for both newspaper from January 1980 onwards. The news index variable is calculated using the method described above. It is not possible for my analysis to calculate the index on a monthly basis since the experts' forecasts are only available on a quarterly basis.

Another variable that is needed for the analysis are consumers' inflation expectations for the next 12 months, separated into different demographic groups. To calculate consumers' expectations, micro data from the Michigan Survey of Consumers is used. The University of Michigan has conducted the consumer survey on a monthly basis since January 1978. Question number A12 in the survey asks how much inflation the respondent expects over the next year.⁶ The means of the answers from the total sample and from the subgroups are used as inflation expectation of consumers.

⁶The exact wording of the question is: "During the next 12 month, do you think that prices in general will go up, or go down, or stay where they are now?" The majority of the respondents answer "go up". If the respondents expect the prices to go up/down, they are asked: "By about what percent do you expect prices to go (up/down) on the average, during the next 12 month?"

The survey data is corrected in the following way. Respondents whose inflation expectations are smaller than -10 percent or bigger than 50 percent are excluded, to correct the data for participants that possibly do not understand the question. This procedure follows the method applied by the University of Michigan for calculating mean values of the inflation expectations. The respondents also have the possibility to answer that they expect the prices to be unchanged over the next 12 months. If this answer is given it is imaginable that respondents are confused between unchanged prices and unchanged inflation. To take account of this potential misinterpretation, the people are asked since March 1982 whether their answer "stay the same" corresponds to the price level or the growth rate of the price level. Asking this question reveals that one-third to one-half of the respondents in each month that answer "stay the same", mean the inflation rate and not the price level. Without this check the calculated means of the inflation expectation would be biased. To avoid this problem my analysis starts in March 1982. Finally the data is weighted to be representative for the US citizens following again the methods used by the Michigan University (Cf. Curtin (1996)).

The last variable that is needed is the inflation expectation of experts for the next 12 months. Inflation forecasts of the Survey of Professional Forecasters (hereafter SPF) are used as expert forecasts. The SPF has been conducted by the Federal Reserve Bank of Philadelphia on a quarterly basis since the third quarter of 1981. Just after the middle of the second month of each quarter the survey is distributed and has to be answered in the following couple of weeks. The mean of the one-year-ahead forecasts for the consumer prices is used as experts' inflation expectation.

4 Estimation results

This section presents the results of the investigation. The analysis if and how news about inflation influences the deviation between the inflation forecasts of different consumer groups and expert forecasts is done on a quarterly basis. The time horizon ranges from the second quarter of 1982 to the fourth quarter of 2007. The relationship between the deviation from consumers'

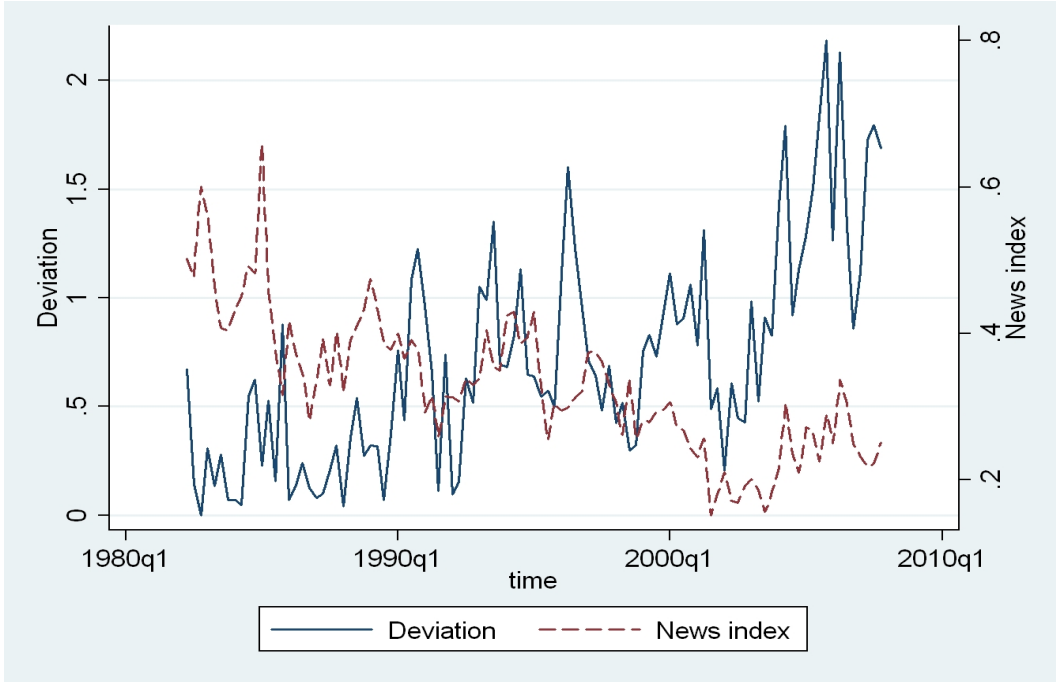


Figure 1: Absolute deviation versus news index (total sample)

and experts' inflation forecast and the amount of news concerning inflation is analyzed by the equation described in Section 2:

$$Deviation_{i,t} = \alpha_1 + \alpha_2 NEWS_t + \varepsilon_t \quad (1)$$

Where $Deviation_{i,t}$ describes the absolute difference between expert forecast and the average forecasts of the i 's consumer group in quarter t . To get an overview of the data, Figure 1 presents the absolute deviation between consumer and expert forecasts and the news index over time. The deviation in the figure is that of the representative American consumer to the expert forecast.

It seems that these two variables are negatively correlated. While the amount of news about inflation decreases over time, consumers' deviation to expert forecasts increase. The check whether this presumption can be statistically supported and if this correlation is present for different demographic groups is done in this section. The depending variable is calculated as ab-

solute differences between consumer and expert forecasts. Nevertheless the following results are similar for squared differences.⁷ In a first step, equation (1) is estimated by an OLS regression where $NEWS_t$ represents the news index in the actual period. The use of the news in the actual period comes along with some problems as explained in section 3. Therefore I also check for the influence of the news one period ago by running a regression with the lagged values of the index values $NEWS_{t-1}$. Following the argumentation in Section 2, a negative relationship between the amount of news and the deviation between consumer and expert forecasts would be expected. The results of the regressions and the numbers of observations are presented in Table 1.

The results presented in Table 1 show indeed a clear finding for the full sample in favor of the hypothesis that news influences the deviation negatively. The estimator $\widehat{\alpha}_2$ is statically significant and negative. This result is independent of the time choice concerning the news variable. But it can also be seen that this is not true for all subgroups. Not all $\widehat{\alpha}_2$ are significant but if they are significant, they are negative.

The results are slightly different dependent whether the amount of news in the actual period or one period ago is taken into account. The positive constant of the OLS regression is statistically significant for almost all subgroups but the influence of the NEWS variable is very different. The influence of news is not significant for male but for female. The disaggregation into different education levels shows that more news one period ago improves the forecast deviation only for middle and high educated persons. Actual news only influences the forecast deviation of consumers that are middle educated. Concerning different age levels, the amount of news one period ago has a significant influence on consumers' inflation expectations of individuals that are older than 35 years.

News from the actual and the lagged period influences only people that are in the first and second income quartile. The constant and the news variable are significant for all different regions and respondents that have and don't have children, independent of the choice of the time structure for

⁷The results are available by the author on request.

$Deviation_{i,t} =$	$\alpha_1 + \alpha_2 NEWS_t + \varepsilon_t$		$\alpha_1 + \alpha_2 NEWS_{t-1} + \varepsilon_t$		Obs.
	$\widehat{\alpha}_1$	$\widehat{\alpha}_2$	$\widehat{\alpha}_1$	$\widehat{\alpha}_2$	
Full sample	1.39***	-2.04***	1.49***	-2.35***	141,626
Male	0.43*	0.45	0.65**	-0.27	65,451
Female	1.63***	-1.39*	1.69***	-1.56*	76,175
Low education	2.21***	-1.74	2.32***	-2.02	13,456
Middle education	1.78***	-2.85***	1.88***	-3.14***	74,615
High education	0.73***	-0.67	0.89***	-1.17*	52,445
under 34 years	1.08***	-0.79	1.14***	-0.97	35,192
35-53 years old	1.35***	-1.83***	1.40***	-1.97***	63,340
above 54 years	1.10***	-0.92	1.37***	-1.79*	45,453
1st Quartile Income	2.00***	-1.73*	2.18***	-2.23**	35,760
2nd Quartile Income	1.44***	-2.09***	1.53***	-2.34***	34,392
3rd Quartile Income	0.70***	-0.43	0.85***	-0.92	32,453
4th Quartile Income	0.26	0.88	0.45**	-0.25	30,595
West	1.28***	-1.77***	1.34***	-1.93***	28,606
North Central	1.14***	-1.11*	1.28***	-1.56**	38,612
Northeast	1.35***	-1.93***	1.37***	-1.98**	27,007
South	1.49***	-2.06***	1.58***	-2.33***	47,356
No children	1.26***	-1.74**	1.46***	-2.37**	85,364
Children	1.33***	-1.39***	1.36***	-1.46***	55,918

All standard errors are corrected for heteroscedasticity and serial correlation using a Newey-West procedure with four lags. *, **, *** indicate statistically significance to the 10, 5, and 1 percent level respectively.

Table 1: Impact of news (News are measured relatively)

the news.

The estimated coefficients of the constant and the news index of the regressions with the lagged news index are always higher compared to the estimated values of the regressions without the lag. Nevertheless the results concerning the significance are often the same for both approaches. The amount of news concerning inflation does not improve the deviation of the inflation forecasts between consumers and experts for men, low educated people, young people, and people with a high income.

To get a better economic interpretation about the influence of news on the deviation, regressions with the total amount of news in each quarter are

also run. In contrast to the first regressions for that an index value for the amount of news is used. Again news from the actual period and one period ago is employed. With the total amount of news, an interpretation by how many percentage points the forecast gap is narrowed if one more article is printed is possible. The results are shown in Table 2.

$Deviation_{i,t} =$	$\alpha_1 + \alpha_2 NEWS_t + \varepsilon_t$		$\alpha_1 + \alpha_2 NEWS_{t-1} + \varepsilon_t$	
	$\widehat{\alpha}_1$	$\widehat{\alpha}_2$	$\widehat{\alpha}_1$	$\widehat{\alpha}_2$
Full sample	1.43***	-0.0011***	1.54***	-0.0013***
Male	0.44*	0.0002	0.65**	-0.0001
Female	1.67***	-0.0007*	1.75***	-0.0009***
Low education	2.02***	-0.0008	2.35***	-0.001
Middle education	1.83***	-0.0015***	1.94***	-0.0017***
High education	0.75***	-0.0004	0.91***	-0.0006*
under 34 years	1.09***	-0.0004	1.19***	-0.0005**
35-53 years old	1.37***	-0.001***	1.47***	-0.0011***
above 54 years	1.48*	-0.0008	1.41***	-0.001*
1st Quartile Income	2.03***	-0.0009*	2.23***	-0.0012**
2nd Quartile Income	1.46***	-0.0011***	1.58***	-0.0013***
3rd Quartile Income	0.72***	-0.0002	0.88***	-0.0005
4th Quartile Income	0.26	0.0004	0.45**	0.0001
West	1.75***	-0.0016***	1.41***	-0.0011***
North Central	1.15***	-0.0006*	1.30***	-0.0008**
Northeast	1.38***	-0.0010**	1.42***	-0.0011**
South	1.53***	-0.0011***	1.63***	-0.0012***
No children	1.29***	-0.0009**	1.49***	-0.0012***
Children	1.35***	-0.0007**	1.43***	-0.0008***

All standard errors are corrected for heteroscedasticity and serial correlation using a Newey-West procedure with four lags. *, **, *** indicate statistical significance to the 10, 5, and 1 percent level respectively.

Table 2: Impact of news (News are measured absolutely)

The results indicate that the negative effect of the news index is also found for the total amount of news. If the influence of the amount of news is statistically significant, the size of the effect is between -0.0007 and -0.0013 independent of the timing of the news variable. At first glance these values seem to be very small. But an effect of -0.0010 means that 100 more inflation

news article in a quarter or about one additional inflation news article a day in one of these newspapers narrows the deviation by 0.1 percentage points. This is a remarkable result because Figure 1 indicates that the deviation is at most two percentage points and often between zero and one percentage point.

Another way to test if the amount of news influences the forecast accuracy is to split the sample in periods with more news than on average and in periods with less news than on average and run a regression for each subsample on the following equation:

$$\pi_t^C - \pi_{t-1}^C = \lambda(\pi_t^E - \pi_{t-1}^C) + \delta_t$$

Where λ can be interpreted as the speed of adjustment of the consumers' inflation forecasts to the experts' inflation forecasts. The results are presented in Table 3. The column " $\hat{\lambda}$ high" corresponds to the estimated $\hat{\lambda}$ that results from an OLS regression if only the periods with more news than on average are taken into account. That means that $NEWS_t > mean(NEWS)$. The column " $\hat{\lambda}$ low" corresponds to the results for quarters in that the actual news index is lower than its mean: $NEWS_t < mean(NEWS)$.

The results indicate that the speed of adjustment is higher in periods in which more news than on average is available. For all groups $\hat{\lambda}$ is higher in column " $\hat{\lambda}$ high" than in " $\hat{\lambda}$ low" and all estimated coefficient are statistically significant. This can be understood as further evidence that more news about inflation narrows the deviation between consumers' and experts' inflation forecasts.

5 Conclusion

The analysis in this paper shows that with more inflation news in newspapers the gap between inflation forecasts of experts and the representative American consumers gets smaller and that the speed of adjustment is higher if more news is available. The results are robust for the amount of news in the actual period and the amount of news one period ago. But these findings

<i>Speed of adjustment</i>	$\widehat{\pi}_t^C - \widehat{\pi}_{t-1}^C = \lambda(\widehat{\pi}_t^E - \widehat{\pi}_{t-1}^C) + \delta_t$		
	$\widehat{\lambda}$ All obs.	$\widehat{\lambda}$ high	$\widehat{\lambda}$ low
Full sample	0.18***	0.45***	0.11*
Male	0.26***	0.47***	0.16*
Female	0.12***	0.23***	0.10**
Low education	0.15***	0.24***	0.12**
Middle education	0.15***	0.45***	0.09*
High education	0.38***	0.76***	0.21**
under 34 years	0.28***	0.50***	0.15**
35-53 years old	0.22***	0.53***	0.13**
above 54 years	0.22***	0.45***	0.18**
1st Quartile Income	0.09**	0.17***	0.10**
2nd Quartile Income	0.30***	0.77***	0.13*
3rd Quartile Income	0.36***	0.62***	0.21**
4th Quartile Income	0.34***	0.36***	0.32**
West	0.27***	0.63***	0.16***
North Central	0.22***	0.42***	0.17**
Northeast	0.33***	0.69***	0.24**
South	0.18***	0.44***	0.13**
No children	0.20***	0.50***	0.14**
Children	0.19***	0.40***	0.11**

All standard errors are corrected for heteroscedasticity and serial correlation using a Newey-West procedure with four lags. *, **, *** indicate statistical significance to the 10, 5, and 1 percent level respectively.

Table 3: Speed of adjustment

do not hold for all demographic group. The findings are only robust for the representative consumer, women, middle educated people, low and middle income persons. They can not be verified for men, low educated people, and high income individuals.

If the news variable represents the total amount of news and not an index, the results show that one additional article a day tends to reduce the forecast deviation by about 0.1 percentage points. In summary, the negative correlation between the amount of news concerning inflation and the deviation between consumers' and experts' forecasts is robust for the representative American consumer. But this does not hold for all demographic

groups. Therefore the existing opinion in the literature that inflation news influences the deviation between consumers' and experts' inflation forecasts negatively should be treated carefully.

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