

The Role of Media for Consumers' Inflation Expectation Formation*

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Preliminary version

Abstract

This paper analyzes the impact of the media on consumers' inflation expectations. We distinguish two channels through which media can influence expectations. First, the intensity of coverage of inflation reports plays a role (volume channel). Second, the contents of these reports matter (tone channel). Employing a unique data set capturing media reports on inflation in Germany comprising 01/1998–12/2006 we are able to discriminate between these two effects. We find that the volume effect improves the accuracy of consumer forecasts while the tone channel induces a media bias. Moreover, those effects vary with income, age and education of the respondents.

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1 Introduction

Controlling inflation is the main objective of central banks. Both theoretical considerations and empirical evidence show that inflation expectations are one of the main determinants of future inflation rates. Although central banks nowadays claim that managing consumers' inflation expectations has become one of their most important tasks, still very little is known about the way consumers form their expectations. This paper adds to the understanding of consumers' inflation expectation formation by investigating the role of media as a transmitter and filter of news.

There is a keen interest in the literature to adequately capture expectation formation. Expectation modelling has moved away from assuming perfectly informed fully rational consumers to sporadically informed and rationally inattentive agents. Consumers are likely to possess only constrained information on current economic developments or limited capabilities in processing information.

A well-known theoretical approach by [Mankiw and Reis \(2002\)](#) develops the idea that information is sticky, which means that economic agents update their expectations only from time to time. Outside their updating periods consumers are inattentive. One reason for this behavior may be an underlying convex cost function of information processing as proposed by [Sims \(2003\)](#) and [Moscarini \(2004\)](#). [Mankiw et al. \(2003\)](#) find support for the above hypothesis focussing on several inflation expectation surveys for the U.S. Those studies highlight two issues. First, people do not use all information available and second, due to the cost effect, they will rely on certain common sources in order to share costs of information acquisition. One such source clearly is the media that provide news relatively cheaply to everybody ([Kwiek, 2006](#)).

Our study is related to [Carroll \(2003\)](#), who assumes that consumers update their inflation expectations from the media, which transmit rational expectations of professional

forecasters to the general public. The assumption that consumers get their macroeconomic views from the news media instead of investing time into obtaining relevant information from other sources to form their views on the economy seems plausible.¹ Carroll finds that more frequent media reporting makes consumers' expectations more accurate as they update their beliefs more often than during times of less media coverage. This would imply that consumers' inflation beliefs are rational but they update their information only infrequently as in a Mankiw-Reis fashion, and hence not all consumers have the most actual information on inflation developments. Therefore, the higher the number of media reports on inflation, the more likely consumers update their beliefs and the closer they are to the rational forecast.²

A point Carroll does not address is the role the content of the statement plays. It is of great importance not only to account for the amount of news, but also monitor the message that is transmitted. Articles often discuss whether inflation is, was or will be rising or falling and thus people consuming the report will use the opinion transmitted to update their own judgement on this topic.

Therefore, we add a second dimension and distinguish *two* theoretical channels on how media reports may affect consumers' inflation expectations. First, in line with [Carroll \(2003\)](#) we argue that the intensity of reporting about inflation matters. This argument is incorporated in our *volume* channel. If newspapers and TV broadcasts deliver more reports on inflation this increases the likelihood that consumers become more aware of inflation and triggers an updating of their expectations on this issue. As a consequence this implies that consumers' forecast accuracy improves. Second, the *tone* of reporting gives consumers signals in which direction to revise their expectations. The latter channel could also increase forecast accuracy if reporting is consistent with what we consider to be

¹As information is non-rival in consumption and there are marginal costs of replication people have incentives to gather information from media than invest individually in research activity.

²For practical reasons a rational forecast is defined as the forecast of professional economists.

the rational forecast. However, the *tone* within the media can also induce a media bias by, for instance, exaggerating negative news relative to positive ones.³ Hence, the quality of the media report decides about the effect the *tone* channel has on consumers' expectations: It can either improve accuracy if the quality of information provided by media is high or deteriorate the forecast accuracy if the media report is biased.

To test the impact of the proposed channels on the gap between consumers' inflation expectations and professional forecasters' expectations we employ an unique and detailed media data set of news reporting on inflation comprising the period 01/1998–12/2006 in Germany on a monthly basis.⁴

We find statistical support for both channels: the number of reports on inflation leads to a tightening of the gap between consumers and professional forecasters' expectations. The tone within the report points towards the existence of a media bias: the share of news that report rising inflation relative to the share of news reporting falling inflation widens the gap. We also provide evidence that the relationship exhibits a different pattern during the phase of the Euro cash changeover, where also consumers' inflation perceptions displayed very unusual patterns (Lamla and Rupperecht, 2007). This finding is robust for different specifications. We show that both channels matter most with respect to contemporaneous developments. Finally, we survey how the observed impact varies with the socioeconomic background. We provide evidence that older and more educated people are less prone to such a bias and for them the improvement of the *volume* channel is more substantial.

These findings have important implications: as inflation expectations are one of the main determinants of future inflation, our results suggest that media influence these expectations and thereby may influence future inflation. This raises the question how this would alter economic outcomes. Therefore, media could be seen not just as a transmitter

³There is some evidence that indeed negative news are more often reported. See for instance Groeling and Kernell (1998) or Lamla et al. (2007).

⁴We capture 26 newspaper and television channels.

of unbiased news but also as an economic actor.

The next sections are organized as follows. Section 2 derives the hypothesis we test. Section 3 introduces the data and the methodology we utilize. In section 4 the results are presented and discussed while section 5 concludes.

2 Hypotheses

In this section we will discuss the role media plays in driving inflation expectations. We will recapitulate preceding studies and formulate our hypothesis.

News reports transmit new information to a broader public. In the transmission process, both the quantity and the content of stories matter. Hence, media can influence inflation expectations of consumers via two channels.⁵

The first channel is the *volume* or quantity channel. More news reporting provides information to consumers, makes them more attentive and triggers the updating of their expectations. If consumers face costs of acquiring, absorbing and processing information, consumers rationally choose to only sporadically update their information (Reis, 2006). It is unlikely that each consumer has full understanding of macroeconomic dynamics and constantly reviews the latest statistics to produce his own inflation forecast. Also not every person is able to read every article in the continuum of news provided every day. This implies that if there are many news stories on inflation within a given month, it is more likely that a consumer reads or watches these news, becomes aware of this specific issue and updates his information set that generates his expectations. Therefore, our first hypothesis is: *more media reporting brings consumers' forecasts closer to the rational forecast.*

Hypothesis 1 closely follows the line of argumentation in Carroll (2003): people are assumed to obtain their macroeconomic views from the news media. Not every person pays

⁵Doms and Morin (2004) also incorporate both channels discussing the relationship between media reporting and consumer sentiment indicators.

close attention to all macroeconomic news and therefore individual people are assumed to absorb the economic content of news stories probabilistically, so that it takes time for news of changed macroeconomic circumstances to be received by all agents in the economy. Carroll assumes that the news media reports the views of professional forecasters, who themselves make rational forecasts. This would imply that consumers update their expectations with the rational forecast. This assumption, however, might be, from our point of view, overly optimistic and thus may not have general validity. Media companies may have some incentives to twist or exaggerate certain developments. One could argue that media companies want to increase their profits by catering to the prejudice of the reader. In addition, the owners of media companies might also have some self interest.⁶ In media and political science research it is a common finding that media can transmit biased news to their consumers (Hetherington, 1996).

So far we have only focussed on the consequences of changes in the intensity of the coverage on a certain topic. However, the content of the reports is also of major importance. This is a point that Carroll does not take into account. Some empirical evidence for the claim that media shapes peoples' expectations exists. For instance, [Berger et al. \(2007\)](#) show that consumers' inflation expectations across the Euro area react to more favorable reporting on the ECB in the main newspapers. [Doms and Morin \(2004\)](#) show that news affect consumers perception on the economy by using the R-word index from *The Economist* measuring the frequency of the word "recession" in the media. The effect of the content, or tone, of the report can go in both directions, depending on the quality of reporting.

If the informational content of media reports is unbiased and of high quality, our indicator for the tone of the report should improve the forecast accuracy of consumers. Therefore our hypothesis 2a is: *the tone of the report brings consumers' forecasts closer to the rational forecast.*

⁶[Gentzkow and Shapiro \(2006b\)](#) discuss the relevance of ownership structure for the media slant in U.S. newspapers.

If, on the other hand, the content of media reports is biased, the tone of the report impairs the accuracy of consumers' forecasts. As [Hamilton \(2004\)](#) notes, "news is a commodity, not a mirror image of reality" (p. 7). The reason for this may be the profit maximizing behavior of the media companies. In the decision process which news to transmit, media supply what is demanded: interesting and exciting stories. For instance, exaggerating bad news might be the profit maximizing choice from a media companies point of view. Hence, such news stories might well exaggerate actual developments to provide the story they need to sell. This would imply the existence of a so-called media bias, i.e. exceptional news may be overemphasized, distorted or fabricated to boost commercial ratings.⁷ Anecdotal evidence taken from *The Economist*: "Journalists are writing us into a recession" (4th of October 2006) suggests that media may not only provide information but they might bias the impact of news on consumers' expectations in a certain direction. Empirical evidence for the existence of a media bias is provided in [Shah et al. \(1999\)](#), who find that the media give only little attention to the economy when it is in good shape but report extensively when it is in bad shape.⁸ [DellaVigna and Kaplan \(2007\)](#) provide evidence that the introduction of biased news reporting has significantly affected voting in the U.S. [Hetherington \(1996\)](#) puts forward that media consumption and attention through the mass media negatively shaped voters' retrospective economic assessments in the 1992 election. Overall, these studies suggest that media play an important role in opinion making and also allow for the existence of a media bias.

If indeed consumers update their information sets by absorbing the content provided by the media, the existence of a media bias has obvious consequences for expectation formations. For instance, if in a given month fifty news articles report that inflation will go up and only ten state it will go down, consumers that form their views from the media

⁷[Hamilton \(2004\)](#) discusses the choices media have about the question which news to bring into their reports. He shows that "hard news" (such as facts about government and politics) become more and more replaced by "soft news" (human interest and entertainment figures) to give more return to media outlets.

⁸In a similar fashion see also [Groeling and Kernell \(1998\)](#).

are more likely to rather revise their expectations upwards than downwards. If no media bias existed, the tone of reports should bring consumer inflation expectations closer to the rational forecast. However, if there is a media bias present, the tone of reports could push away expectations from the rational forecast. We therefore test our hypothesis 2b: *the content and tone of media reporting impairs the accuracy of consumers' forecasts*. Notably, by exaggerating some news, thereby increasing the weight consumers give to it, the media would be able to drive away consumers' forecast from the rational forecast.

3 Data and Methodology

To analyze this issue we need data for inflation expectations of consumers and the rational forecasts of professional economists as well as a measure for the extent and content of inflation reporting by the media in a given period. For the latter we rely on data kindly provided by a media research institute, Mediatenor. The data comprises news articles and media releases on a monthly frequency for the time span 01/1998–12/2006 in Germany covering statements dealing with inflation which are at least five lines long in case of printed media and last at least five seconds for television broadcasts.⁹ The data contain different specifications. We are provided with the overall number of reports in that given period, the amount on rising and falling inflation and whether the focus of the report was mainly the present, the past or the future.¹⁰ The measure of news intensity (*Volume*) is simply the number of inflation reports within a given month divided by the maximum

⁹In detail following news sources are analyzed: Daily press: Frankfurter Allgemeine Zeitung, Welt, Süddeutsche Zeitung, Frankfurter Rundschau, Tageszeitung, Bild, Neue Züricher Zeitung, Berliner, Volksstimmer, Sächsische, Westdeutsche Allgemeine Zeitung, Kölner Stadt-Anzeiger, Rheinischer Merkur; daily TV-News: ARD Tagesschau, Tagesthemen, ZDF Heute, Heute Journal, RTL Aktuell, SAT.1 18:30, ProSieben Nachrichten; Weekly Press: Spiegel, Focus, Die Woche, Wochenpost, Welt am Sonntag, Bild am Sonntag, Die Zeit.

¹⁰The coding is based on the standards of the media research institute. Those people have a sound education in transforming the semantics into quantitative figures. Moreover, they achieve a high correlation so that the coding only has a minimum of individual judgement inherent.

number of reports. The measure for the *tone* is calculated by subtracting the share of news reporting rising inflation from the share announcing falling inflation. Furthermore, in order to control for asymmetries in the response to news on falling respectively rising inflation we construct a variable summarizing the share of reports on rising inflation (*TonePos*) and in a similar fashion *ToneNeg* denotes reports on falling inflation. Moreover, we are able to also count the news stories with regards to the time structure, i.e. whether the story is related to past (*TonePast*), present (*ToneContemp*) or future (*ToneFut*) inflation. They are constructed the same way as the overall *tone* measure, i.e. divided by the maximum of the specific series to bound the measures between zero and one.

Data on consumers' inflation perception and expectations are taken from the EU business and consumer survey on a monthly frequency. German consumers are being asked whether they expect prices to rise, fall or remain unchanged in the upcoming 12 months (expected inflation). We also employ disaggregated data based on socioeconomic characteristics like age, income, education and gender. Income level is divided into 4 quartiles, age is separated into four groups: 16–29, 30–49, 50–64 and 65+, and education is allocated into three groups: primary education, secondary education and further education. Inflation expectations for Germany from professional forecasters are constructed from Consensus Economics forecasts. In that survey, several professional economists are asked about the inflation prospects of the contemporary and upcoming year.

Following the approach of [Carroll \(2003\)](#), we measure the news index by dividing the number of stories on inflation in a given month by the maximum number of inflation stories in any year. The index ranging between zero and one is named *Volume_t*. To measure the deviation of consumers from an optimal forecast we calculate the absolute value of the gap of the difference between the consumers survey (C_t) inflation expectations and those of the consensus economics professional forecasters (P_t) as $absGapExp = ABS(C_t - P_t)$. To make the series comparable we standardize both series, C_t and P_t by dividing each observation

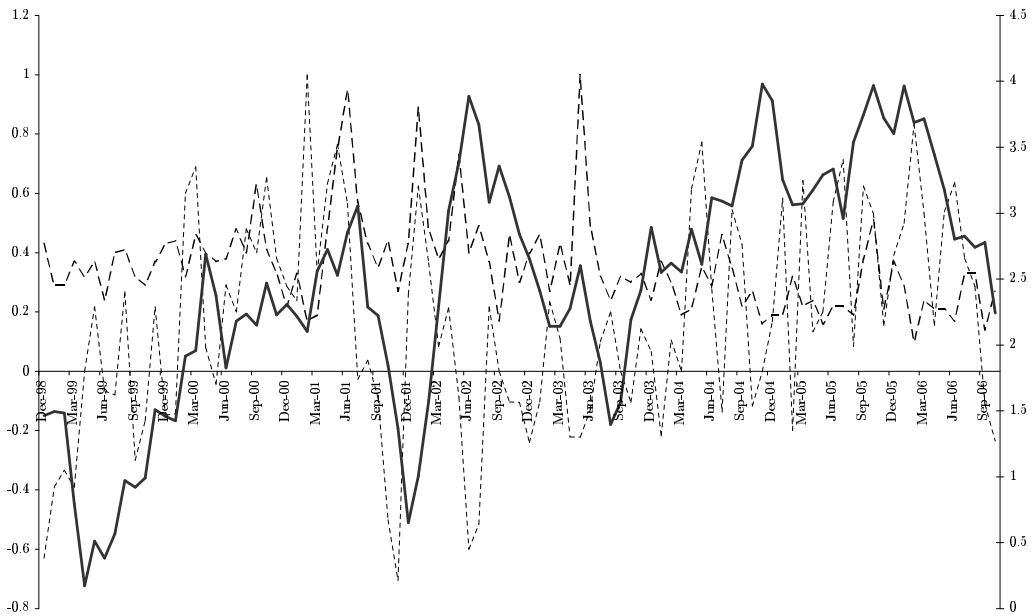
by the series' own standard deviation. In the original specification Carroll used the squared gap. However, as this measure might overweight specific incidences we decided to employ the absolute gap. Notably, this makes no big difference when it comes to the conclusion. The summary statistics of our variable set are given in Table 1.¹¹ The series of the gap between consumers and producers as well as our *tone* and *volume* measures are depicted in Figure 1.

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	Observations
absGapExpFemale	2.53	0.92	0.27	4.04	94
absGapExpMale	2.42	0.92	0.21	3.93	94
absGapExp65+	2.35	0.91	0.16	3.92	94
absGapExp50-64	2.40	0.88	0.19	4.02	94
absGapExp30-49	2.55	0.96	0.27	4.16	94
absGapExp16-29	2.65	0.92	0.27	4.48	94
absGapExpEdFurth	2.71	0.83	0.58	4.11	94
absGapExpEdSec	2.52	0.88	0.28	4.11	94
absGapExpEdPrim	2.42	0.99	0.00	4.22	94
absGapExpInc4Q	2.50	0.96	0.11	4.12	94
absGapExpInc3Q	2.30	0.91	0.13	3.91	94
absGapExpInc2Q	2.48	0.85	0.34	4.17	94
absGapExpInc1Q	2.26	0.86	0.24	3.88	94
absGapExp	2.47	0.92	0.17	3.98	94
Tone	0.16	0.36	-0.71	1.00	94
Volume	0.36	0.16	0.10	1.00	94
VolumeNeut	0.21	0.12	0.00	1.00	94
ToneFuture	0.17	0.45	-1.00	1.00	69
ToneContemp	0.17	0.40	-0.64	1.00	69
TonePast	0.18	0.53	-1.00	1.00	69
Exp Prof	1.47	0.60	0.10	2.80	94
ExpConsumer	23.4	12.2	5.20	46.5	94
ToneNeg	0.20	0.17	0.00	0.76	94
TonePos	0.36	0.22	0.02	1.00	94
Vol Teuro	0.10	0.19	0.00	1.00	94
Vol EuroCashChangeover	0.11	0.14	0.01	1.00	94

¹¹Note that the consumer inflation expectations figure is an index. Thus, the gap is not the difference in the inflation rates.

Figure 1: Media Coverage and Inflation Expectations Gap



Solid line: Absolute gap between consumers' inflation expectations and inflation expectations of professional forecasters; thick dashed line: Sum of all reports on inflation (*Volume*); thin dashed line: Share of news of rising inflation relative to news on falling inflation (*Tone*). Left-hand scale: Media indices; right-hand scale: Gap between consumers and producers.

The deviation of consumers' from professional forecasters' inflation expectations should give us a good proxy of the deviation of consumers from the rational forecast. To see whether media reporting plays a role for the deviation of consumers inflation expectations from the rational benchmark, we estimate following equation via OLS controlling for serial correlation using Newey-West standard errors.¹² This specification is the same as employed in Carroll (2003) except that we lag our explanatory variable by one month. As noted before, he only considers what we call the *volume* channel: the more news reported the more likely are consumers to update their information set. Therefore, we employ the news measure of news intensity, i.e. all inflation reports, without considering its content (*volume*). To test for the influence of the news volume we estimate the Carroll equation

$$absGapExp_t = \alpha + \beta Volume_{t-1} + \varepsilon_t. \quad (1)$$

Alternatively, we consider a second information that might be important. Many of the articles dealing with inflation carry a certain message. For analyzing the rational behavior of consumers it is important to capture the content of those statements. Therefore, we introduce the variable *Tone* to capture the impact of the *tone* channel. Thus the above equation amends to:

$$absGapExp_t = \alpha + \beta Volume_{t-1} + \gamma Tone_{t-1} + \varepsilon_t. \quad (2)$$

If $\beta < 0$ the gap between consumers' and professional forecasters' inflation expectations narrows with higher news intensity. Hence, a higher value of the news index brings consumers' expectations closer to rational expectations. By only considering the first specification, Carroll finds that $\beta < 0$. Concerning the contents of reports, a media bias would

¹²Newey-West standard errors are calculated using lag 3. The lag selection is set by the formula $lag = \lfloor 4(T/100)^{2/9} \rfloor$ where T is the number of observations. This formula is suggested by [Newey and West \(1994\)](#).

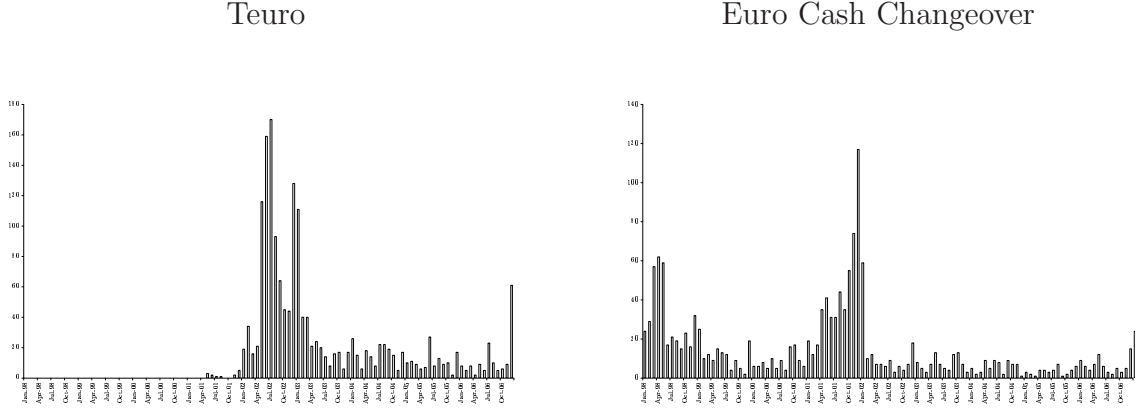
imply that the coefficient estimate for γ would be significantly different from zero and positive. If $\gamma > 0$ reports about rising inflation would lead to exaggerated fears of consumers relative to professionals. If $\gamma \leq 0$ the content of news would give information that is consistent with the views of professional forecasters and therefore be unbiased.

An interesting aspect with respect to the Euro area which was already mentioned in the introduction is the Euro cash changeover and the debate about the inflationary consequences which were attributed to it. Although the Euro cash changeover discussion has not had such strong and visible impact on inflation expectations, as it had on inflation perceptions (Lamla and Rupperecht, 2007), still an effect might have also been present for inflation expectations.¹³ In order to account for that we count the articles dealing with the Euro cash changeover and separately with the word “Teuro”.¹⁴ While the first should capture the discussion of the Euro introduction the second should control for the inflationary fears associated with it by the public. We include both in the analysis because the word “Teuro” contains a judgement on inflationary fears ex-ante, whereas the expression “Euro cash changeover” does not. Both series are depicted in Figure 2. The left bar chart represents the amount of articles using the expression “Teuro” within a month, while the right chart counts “Euro cash change”. The interesting observation is that while the media coverage of the Euro cash changeover breaks down rapidly in February 2002, the coverage

¹³Ehrmann (2006) shows that the gap between perceived and actual inflation widened a lot in Germany during the cash changeover. He finds that the complexity of conversion rates explains the variation in this gap across Euro Area countries. Lamla and Rupperecht (2007) provide evidence that also media reporting play an important role in explaining this discrepancy. Hence, also inflation expectations could be affected by extensive media coverage in that period. Therefore, it seems sensible to discuss how to account for the effects associated with the Euro cash changeover. One obvious way would be to implement dummy variables. With this option one has to decide upon the start and end date of the effect. In order to avoid this possible pitfall we decided to utilize the coverage in the media dealing with the Euro cash changeover. We do this by counting the articles dealing with the Euro cash changeover on the one hand and discussing the price increases using the code word “Teuro” on the other. Obviously, there are various ways to deal with this time frame. While this setup seems to be in line with our media focus we also considered using various dummy variables with different lengths. Even if excluding the rather broad time frame covering 01/2001 until 12/2002 the qualitative results remain.

¹⁴“Teuro” is a concatenation of the words “teuer”, the German equivalent for expensive, and the word Euro.

Figure 2: Number of articles containing “Teuro” respectively “Euroeinführung”



of the inflationary consequences begins becoming a dominating issue in the media. Moreover, it seems to be in the media for about one year on an above average intensity. To control for that effect we estimate a third specification

$$absGapExp_t = \alpha + \beta Volume_{t-1} + \gamma Tone_{t-1} + \delta Euro_{t-1} + \varepsilon_t, \quad (3)$$

where *Euro* specifies either the number of articles containing the expression “Euro cash changeover” or, in a further specification, the word “Teuro”.

So far we have employed the *tone* and the *volume* of inflation reports. Furthermore, we added a control variable for the Euro cash changeover period. As expectations are by definition related to future events, it seems sensible to control for that. To account for this, we construct the variables *ToneContemp*, *TonePast* and *ToneFut* representing the share of news on inflation with main focus on the present, the past or the future. Note, that the time dimension is available since the year 2001. Consequently this yields to a fourth specification represented by equation 2:

$$\begin{aligned}
absGapExp_t = \alpha + \beta Volume_{t-1} & \tag{4} \\
+ \gamma_c ToneContemp_{t-1} + \gamma_p TonePast_{t-1} + \gamma_f ToneFut_{t-1} + \varepsilon_t. &
\end{aligned}$$

4 Results

This section presents and discusses the estimated coefficients for different specifications. In a second subsection we report estimates of inflation expectations of different groups distinguished by socio-economic characteristics.

4.1 The Impact of Media on Aggregate Measures of Inflation Expectations

Table 2 contains the coefficient estimates of the regression setup. In column (1) the estimates of equation 1 are presented. We can observe that the sign of the coefficient estimate is in line with Carroll’s hypothesis, i.e. that more media reporting improves forecast accuracy of consumers. However, the variable is not significant. As a next step we include our *Tone* variable by estimating equation 2. Column (2) reveals that the tone increases the gap and hence drives consumers’ forecasts away from the rational benchmark. Moreover, the *volume* channels still remains insignificant. This might be due to the fact that for Germany the data include the Euro cash changeover period, where inflation perceptions displayed very unusual patterns.¹⁵ We estimate equation (3) including the articles dealing

¹⁵It is necessary to distinguish between inflation perceptions and inflation expectations here. Both series are published by the European Commission. For the measure of inflation perceptions consumers are asked what they think about price developments in the last 12 months, whereas the question about the expected price movements in the next 12 months serve as the underlying data for the measure of inflation expectations. For example Ehrmann (2006) shows that inflation perceptions are significantly higher than true inflation rates during the Euro cash changeover in Germany. The deviation of inflation perceptions from inflation measured by the Harmonized Index of Consumer Prices (HICP) is also much

with “Teuro”. For that specification reported in column (3) we observe a significant positive impact of “Teuro”. Furthermore the *volume* channel becomes significant and negative, as predicted by theory and in line with Carroll (2003). Thus, it appears to be necessary to control for this “Teuro” debate for the German data. Moreover, this debate exaggerates the inflationary fears and leads to a divergence of inflation expectations from the rational benchmark. This result implies that the two effects of media are also present in the data: on the one hand, higher media coverage helps updating believes. On the other hand, if media reports contain a certain opinion or tone, the content is biased and therefore drives a wedge between consumers’ and professional forecasters’ expectations. In column (4) we control for the number of articles mentioning “Euro cash changeover” or synonyms. This debate seems to have a similar impact as the *volume* channel and reduces the gap significantly. The difference between the effect of “Teuro” and “Euro cash changeover” is very similar to what we called *volume* and *tone* channel before. The word “Teuro” is a combination of the German words “teuer” denoting expensive and “Euro”. Hence, it contains a clear message that claims that the introduction of the Euro caused an increase in prices. Therefore, it is clearly related to the *tone* channel. The word “Euro cash changeover”, on the other hand, can be seen as neutral as it does not imply any negative connotation. Furthermore, that word might have attracted consumers to read articles regarding the “Euro cash changeover” and the articles discussing the introduction of the Euro are likely to be associated with terms of price stability and inflation. Hence, the attractiveness of the topic Euro cash changeover has a higher probability to be read by consumers than other articles that discuss inflation, especially as those articles might have been often placed at the title page. This leads to higher frequencies of updating. Hence, the impact is similar to that of the *volume* channel. Also the coefficient is larger in absolute terms, confirming that the

more visible in the raw data than the deviation of inflation expectations from their benchmark (the professional forecasters’ expectations) during the changeover period. Given our results, also inflation expectations reacted on the “Teuro” debate in German media reports, although the effect is weaker for expectations than for perceptions (see Lamla and Rupperecht, 2007).

articles on the introduction of the Euro have gained more visibility than articles purely on inflation. This variable may also be seen as an instrument variable. The Euro cash changeover is an exogenous event, which is associated with currency, but, per definition, does not imply anything for the inflation rate as it is basically only a change in conversion rate. This is especially true if we refer to Figure 2. The amount of reporting breaks rapidly down after the cash changeover. Thus, the estimation results based on this explanatory variable reinforce our updating argumentation.

In Column (5) we include both measures and both remain highly significant. As the Euro cash changeover seems to measure qualitatively the same effect as the *volume* channel we discard it from our further analysis and concentrate on the impact of the *tone* channel, the *volume* channel while controlling for the bias generated by the “Teuro” discussion.

As the variable *Volume* contains all press statements we decided to test for the robustness of our results by calculating a variable *VolumeNeut* which excludes statements that contain a certain message about the path of inflation. Despite not statistically significant, the results, presented in column (6), are surprisingly similar to the specification containing the volume reported in column (3). Consequently, this implies that the intensity of inflation reporting triggers an updating of inflation beliefs independent of the message transmitted by the reports.

Next, we test for possible asymmetries between news containing messages on rising respectively falling inflation. There are several studies in behavioral economics that highlight the importance of good and bad news for reactions of financial markets.¹⁶ Thus we separate our *tone* measure into the share of news on rising inflation *TonePos* and share of news on falling inflation *ToneNeg*. Results are presented in column (7). While both news imply a significant response to the information presented, the response to the number of news on falling inflation implies a stronger effect. News on falling inflation decrease

¹⁶Especially, bad news in good times seem to matter most. See for instance Andersen et al. (2003).

the gap between consumer and professional forecasters' expectations, bringing consumers closer to the rational level. This is what is implied by hypothesis 2a: the message within the report is of high quality and hence further improves consumers' beliefs. On the other hand, news on rising inflation seem to increase the gap between consumers' expectations and the rational benchmark, confirming the hypothesis 2b: in news on rising inflation a media bias exists, as these trigger a widening of the gap between consumers' expectations and the rational benchmark.

An important issue is the time dimension. This was neglected in earlier studies and will be addressed in the upcoming paragraph. It seems reasonable to assume that people are highly interested in news about future inflation and that these news affect their expectations about future inflation most. In order to disentangle the different time effects we estimate equation (4). In column (8) the results is reported. We observe that information with respect to contemporary inflation matters. At a first glance this result might be partially puzzling. Obviously, information on future inflation should be the most relevant for forming inflation expectations. However, it may be surrounded by a high degree uncertainty. This may explain why people rely on contemporary events to infer the future path of inflation. Also, the inflation expectation formation process might be more of an adaptive nature. Notably, due to data restriction the time dimension is only available after 2001. This leads to a substantial loss of available data points and efficiency of our estimates. This in turn could explain why the amount of news on future developments is insignificant.

Overall, our results support the results of [Carroll \(2003\)](#) that indeed more news lead to more updating and information processing which finally transmits into better inflation forecasts. Going two steps further we can highlight that, contrary to the positive impact of the amount of news, the specific content of news drives away expectations from the rational benchmark. This media bias is mainly driven by news on rising inflation, which

consumer expectations react more to than rational forecasters. Finally, consumers deduct most implication from present events.

4.2 The Impact of Media on Different Socioeconomic Groups

Several recent studies show that socioeconomic attributes explain patterns in economic behavior. [Berger et al. \(2007\)](#) provide evidence that male and female hold significantly different opinions regarding ECB’s monetary policy performance. [Inoue et al. \(2006\)](#) show that the response in consumer surveys to news on inflation increases with the level of education. On the other hand, [Aucremanne et al. \(2007\)](#) provide evidence that the reaction between those socioeconomic groups was fairly similar during the cash changeover. In an commentary on the demographics of inflation opinion surveys in the U.S., [Bryan and Venkatu \(2001\)](#) point out that the data exhibit a large disparity in inflation estimates of different types of people. They note that young respondents have been found to overestimate inflation. The same is true for low educated people and women. They also controlled for the impact of ethnicity. Overall they find low variability in their data set which points to a systematic different perception within each socioeconomic group.

We have data for different dimensions of the socioeconomic characteristics of the survey participants (income level, age, education level, profession and sex). Data are taken from the EU Consumer Survey. We replicate the regressions in Table 1 for our preferred specification in column (7) including *tone*, *volume* of news and the variable for the Euro cash changeover period capturing the “Teuro” debate. Also the other specifications are fairly robust to splitting the consumer expectations sample in different groups, but not reported here.¹⁷ Results are presented in Table 3. Notably, the main results do not change when differentiating consumer survey inflation expectations data by socioeconomic factors.

¹⁷The results would produce too many tables with the similar outcome, therefore we decided to report only our preferred specification. All other results are available upon request.

Table 2: Regression with Newey-West Standard Errors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Volume	-0.704 (0.630)	-0.596 (0.589)	-1.001* (0.552)	0.024 (0.560)	-0.512 (0.475)		-0.970* (0.532)	-0.849* (0.444)
Tone		0.934*** (0.314)	1.237*** (0.230)	0.835*** (0.290)	1.128*** (0.242)	1.192*** (0.236)		
Teuro			2.172*** (0.523)		1.891*** (0.550)	2.098*** (0.491)	2.146*** (0.537)	1.201** (0.596)
ToneFut								0.293 (0.215)
TonePast								0.173 (0.201)
ToneContemp								0.553* (0.280)
TonePos							0.908* (0.501)	
ToneNeg							-1.665*** (0.519)	
VolumeNeut						-0.605 (0.432)		
EuroCashChangeover				-2.144*** (0.480)	-1.508*** (0.399)			
Constant	2.716*** (0.304)	2.536*** (0.272)	2.413*** (0.270)	2.560*** (0.261)	2.446*** (0.268)	2.195*** (0.217)	2.611*** (0.432)	2.757*** (0.244)
Obs	95	95	95	95	95	95	95	69

Standard errors in parenthesis; ***/**/* denote the 1/5/10%-significance level

Table 3: Results Socioeconomic Characteristics with Newey-West Standard Errors

	Gender		Age				Education			Income				
	female	male	65+	50-64	30-49	16-29	further	secondary	primary	4Q	3Q	2Q	1Q	average
Volume	-1.008*	-0.945*	-0.895	-0.796	-1.101**	-0.872	-0.643	-0.851*	-1.086*	-0.874	-0.805	-0.504	-0.863*	-0.955*
	(0.526)	(0.546)	(0.598)	(0.557)	(0.538)	(0.546)	(0.508)	(0.469)	(0.637)	(0.580)	(0.604)	(0.532)	(0.492)	(0.540)
TonePos	0.939*	0.910*	1.169**	0.669	1.032**	0.827*	0.965*	0.737	1.121**	1.023**	0.776	0.883*	0.861*	0.896*
	(0.497)	(0.504)	(0.561)	(0.503)	(0.519)	(0.476)	(0.502)	(0.463)	(0.552)	(0.498)	(0.557)	(0.471)	(0.480)	(0.500)
ToneNeg	-1.696***	-1.633***	-1.315**	-1.665***	-1.713***	-1.859***	-1.064*	-1.734***	-1.678***	-1.623***	-1.587**	-1.292**	-1.400**	-1.691***
	(0.528)	(0.543)	(0.627)	(0.505)	(0.569)	(0.486)	(0.588)	(0.491)	(0.580)	(0.523)	(0.609)	(0.608)	(0.536)	(0.534)
Teuro	2.184***	2.125***	1.947***	1.930***	2.180***	2.273***	1.977***	2.119***	2.194***	2.466***	1.909***	1.983***	1.897***	2.148***
	(0.524)	(0.552)	(0.562)	(0.524)	(0.556)	(0.534)	(0.509)	(0.537)	(0.555)	(0.544)	(0.623)	(0.481)	(0.558)	(0.539)
Constant	2.678***	2.549***	2.323***	2.590***	2.697***	2.816***	2.612***	2.694***	2.529***	2.525***	2.437***	2.402***	2.355***	2.614***
	(0.426)	(0.433)	(0.482)	(0.431)	(0.445)	(0.390)	(0.422)	(0.398)	(0.479)	(0.432)	(0.483)	(0.421)	(0.429)	(0.431)
Obs	94	94	94	94	94	94	94	94	94	94	94	94	94	94

Standard errors in parenthesis; ***/**/* denote the 1/5/10%-significance level

Above that, we can see that the coefficients for all socioeconomic characteristics vary. However, judging on statistically different responses becomes difficult as the standard errors are quite high and thus tests of equality conditional of identical samples show no significant differences. Nevertheless, keeping this in mind allows to draw careful conclusions. While the systematic bias captured in the constant are fairly the same in all specification, the reaction to the tone, the Teuro bias as well as the volume seems to differ most.

We can observe only a very small difference in the reaction between male and female in all dimensions. Thus, the impact of media does not depend on the gender. With respect to age older people are less prone to a bias than younger people. Maybe some learning takes places and some experiences materializes, or as wealth grows with age the marginal costs of inflation increase and the marginal gain of investing in information of inflation rises. Our estimations also indicate that higher educated people are less subject to a media bias induced by the content of the message. Both, news on rising or falling inflation are incorporated with a higher efficiency. Moreover, they are less affected by the “Teuro” debate. This makes intuitively sense. Well educated are more likely aware of the bias and thus respond less. Higher educated people are likely to be more interested in the business and economics sections of newspapers, or buy newspapers or watch news that cover economic topics. Studies highlight that less educated people spend more time watching television and therefore may be more prone to some hysteresis induced by the media. Turning to the income quartiles the following picture emerges. The higher the income the stronger people’s inflation expectations respond to news about inflation transmitted in media reports. In addition, they are prone to media induced hypes and topical inflationary fears as the Teuro coefficients clearly shows. The effects of income and education should be interrelated and pointing to the same direction as income is on average a function of education. This is, however, just partly true in our estimates. While education works through immunization with respect to the media bias, rising income induces a better updating of the expectation

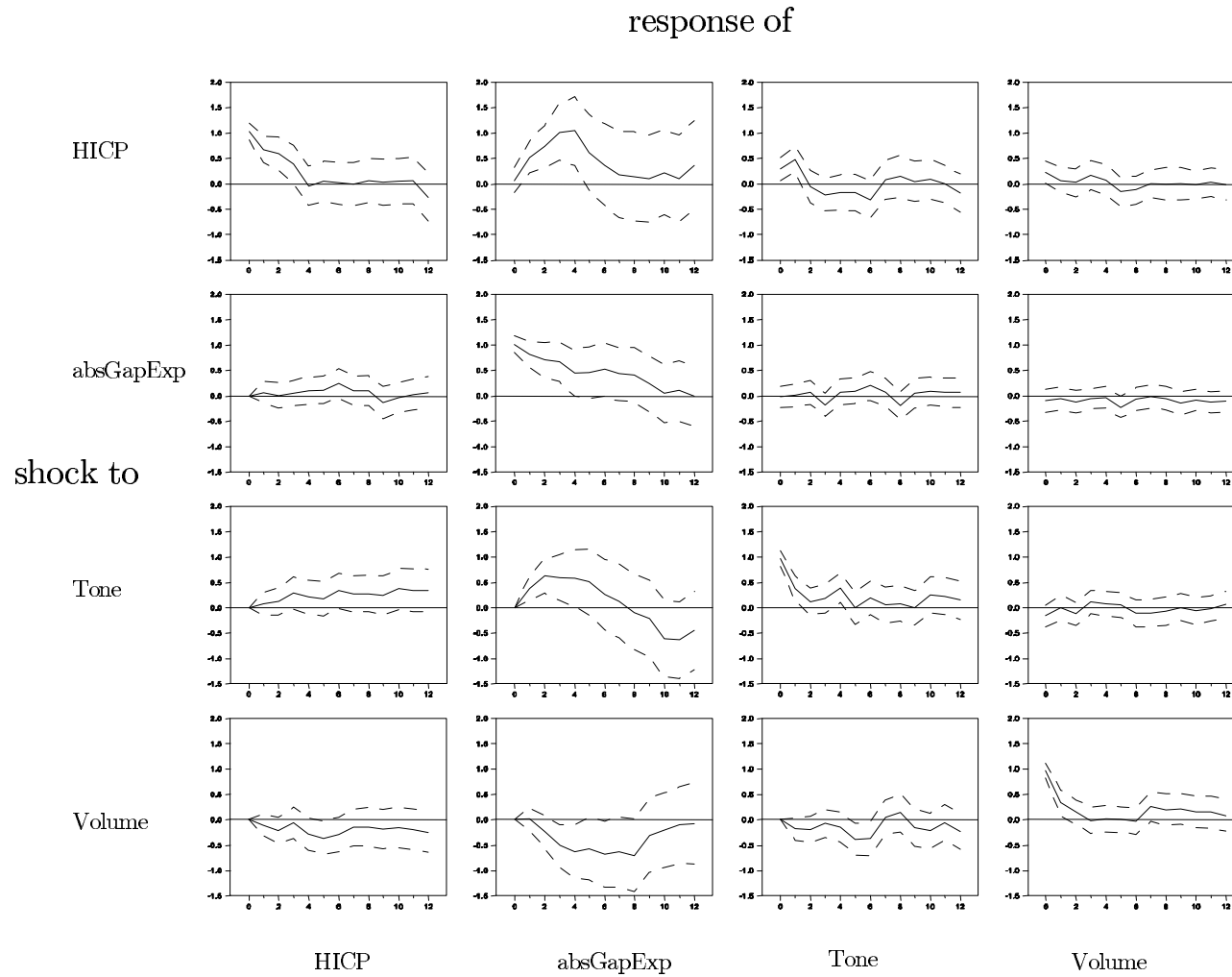
beliefs due to incoming information.

4.3 Robustness

Finally, we would like to address some general issue with respect to endogeneity and causality. One could argue that news are partly demand driven, hence that newspapers are biased towards consumers' prior opinions (e.g. Gentzkow and Shapiro 2006a/b).

Nevertheless, there are some good reasons that this issue does not play a crucial role in the setup chosen in this work. First, in the estimation the indicator is employed with one period lag, using data covering news of the preceding month relative to the questionnaire that establishes the inflation expectations. Thus, per definition, news of the last period cannot be demanded by expectations today. This would only be the case if expectations are highly persistent, an issue addressed in the next paragraph. Second, our dependent variable is the gap between consumers and professionals. Endogeneity, as argued in the first paragraph, would be present if consumers would demand distinctively. If we assume that consumers and professionals demand news equally this would not be an issue. Put it differently, this viscous circle would exist if news companies would only focus on the demand of consumers. However, it is not sensible to assume that. Third, as discussed earlier, the Euro cash changeover variable seems a sensible instrument for the *volume* channel. The demand is driven by an exogenous event not directly linked with movements in prices and inflation, but on the same side it is related to topics like price stability and inflation. The results including this variable reinforce our statements.

Figure 3: Vector Autoregression – HICP, absGapExp, Tone, Volume



Dashed lines represent confidence intervals of two standard deviations.

One final exercise should ultimately underline the robustness of our results. A widely acknowledged way to deal with endogeneity issues as well as to investigate whether a specific notion of causality is present, is to employ vector autoregressions (VAR). Following this path, we also intend to tackle concerns with respect to the estimation setup using the Newey-West correction for autocorrelation. For this purpose we set up a system consisting of the variables *Tone*, *Volume* and *absGapExp*. In addition, in order to control for real shocks to inflation we introduce real-time figures of the Harmonized Index of Consumer Prices (HICP) for Germany. If media just report what is happening in the real world, this would imply that no extra effect of media would be present. Figure 3 depicts the graphs of the impulse responses to specific shocks.¹⁸ We observe that HICP significantly affects the gap as well as the *tone* channel and the *volume* channel. These results correspond with our ex-ante expectations. If figures about rising inflation are released, it is likely that this real shock is picked up by media companies leading to more reports dealing with news about rising inflation. Thus media partly mirror real events. Notably, the effect on the *volume* channel evaporates rapidly. In addition, people seem to overreact to changes in the HICP as the gap widens. In contrast to the reaction to HICP shocks in the media this impact is much more persistent. Concerning our key variables, this exercise reinforces statements given earlier. A shock in the *tone* channel increases the gap while a shock in the *volume* channel reduces the gap. Finally and most importantly, there is no evidence that changes in the gap drive the *tone* and *volume* channel. Thus we can conclude that, even controlling for real events, the *tone* as well as the *volume* channel significantly and robustly drive the gap between consumers and producers.

¹⁸We estimated several VAR systems using various length selection criteria and orderings. However, the results remain unchanged.

5 Conclusion

In this paper we identify two channels via which media influence consumers' inflation expectations. On the one hand, the *quantity* of media reports matters. A higher intensity of reporting makes consumers more likely to pick up news on inflation, induces an update of their expectations and brings them closer to the full information rational forecast. This is what we call the *volume* channel. On the other hand, the *quality* of reporting matters. Media reports often contain an opinion or a tone, which is then taken up by consumers. This is what we denote as the *tone* channel. If the information transmitted by the media has a high quality, consuming the report brings consumers' inflation expectation closer to the rational forecast. If, however, media reports are biased, i.e. if they transmit exaggerated or incomplete information, consuming these reports distorts the accuracy of forecasts.

We provide evidence that both channels play a role. Overall, our results support the view of [Carroll \(2003\)](#) that indeed more news lead to more updating and information processing which finally eventuates in a better inflation forecasts. Furthermore, we highlight that, contrary to the positive impact of the amount of news, the specific content of news drives away consumer expectations from the rational benchmark. In addition, socioeconomic factors influence the reaction to media. Educated and older people are less exposed to the media bias. Moreover, our results indicate the special role of the Euro cash changeover. Especially, the “Teuro” debate has significantly increased the gap. Finally, the content of news matters with respect to the time horizon it addresses: the inflation reports that transmit a message related to the present situation of inflation significantly affect expectations, whereas reports dealing with past inflation do not matter for consumers' expectations. Our results remain even when controlling for possible endogeneity issues as well as shocks in real inflation figures.

Our findings have important implications for the discussions on modeling expectation

formation, the role of media agencies and the assumptions on rationality of consumers' economic behavior: media can have the power to bias consumers' expectations. Such bias could be transmitted into future inflation. Hence, for understanding expectation formation and inflation dynamics, the role of media and the failure to digest the optimal amount of information should clearly be taken into account.

References

- Andersen, T. G., Bollerslev, T., Diebold, F. X., and Vega, C. (2003). Micro effects of macro announcements: Real-time price discovery in foreign exchange. *American Economic Review*, 93(1):38–62.
- Aucremanne, L., Collin, M., and Stragier, T. (2007). Assessing the gap between observed and perceived inflation in the Euro area: Is the credibility of the HICP at stake? NBB Working Paper 112, National Bank of Belgium.
- Berger, H., Ehrmann, M., and Fratzscher, M. (2007). Monetary policy and the media. mimeo, European Central Bank.
- Bryan, M. F. and Venkatu, G. (2001). The demographics of inflation opinion surveys. Commentary, Federal Reserve Bank of Cleveland.
- Carroll, C. D. (2003). Macroeconomic expectations of households and professional forecasters. *The Quarterly Journal of Economics*, 118(1):269–298.
- DellaVigna, S. and Kaplan, E. (2007). The Fox News effect: Media bias and voting. *The Quarterly Journal of Economics*. forthcoming.
- Doms, M. and Morin, N. (2004). Consumer sentiment, the economy, and the news media. FRBSF Working Paper 2004-09, Federal Reserve Bank of San Francisco.
- Ehrmann, M. (2006). Rational inattention, inflation developments and perceptions after the Euro cash changeover. Working Paper Series 588, European Central Bank.
- Gentzkow, M. and Shapiro, J. M. (2006a). Media bias and reputation. *Journal of Political Economy*, 114(2):280–316.

- Gentzkow, M. and Shapiro, J. M. (2006b). What drives media slant? evidence from U.S. daily newspapers. NBER Working Papers 12707, National Bureau of Economic Research, Inc.
- Groeling, T. and Kernell, S. (1998). Is network news coverage of the president biased? *Journal of Politics*, 60:1063–1087.
- Hamilton, J. (2004). *All the News Thats Fit to Sell: How the Market Transforms Information into News*. Princeton University Press, Princeton, N.J.
- Hetherington, M. J. (1996). The medias role in forming voters national economic evaluations in 1992. *American Journal of Political Science*, 40:372–395.
- Inoue, A., Kilian, L., and Kiraz, F. B. (2006). Do actions speak louder than words? Household expectations of inflation based on micro consumption data. Discussion Paper Series 1: Economic Studies 2006, 26, Deutsche Bundesbank, Research Centre.
- Kwiek, M. (2006). Mass media: Constrained information and heterogenous public. Working Paper 0606, University of Southampton.
- Lamla, M. J. and Rupperecht, S. M. (2007). The impact of media on perceived inflation during the Euro cash changeover. mimeo, KOF ETH Zurich.
- Lamla, M. J., Rupperecht, S. M., and Sturm, J.-E. (2007). News and business cycle co-movement. mimeo, KOF ETH Zurich.
- Mankiw, N. G. and Reis, R. (2002). Sticky information versus sticky prices: A proposal to replace the new Keynesian Phillips curve. *The Quarterly Journal of Economics*, 117(4):1295–1328.
- Mankiw, N. G., Reis, R., and Wolfers, J. (2003). Disagreement about inflation expectations. Working Paper 9796, NBER.

- Moscarini, G. (2004). Limited information capacity as a source of inertia. *Journal of Economic Dynamics and Control*, 28(10):2003–2035.
- Newey, W. and West, K. (1994). Automatic lag selection in covariance matrix estimation. *Review of Economic Studies*, 61:631–653.
- Reis, R. (2006). Inattentive consumers. *Journal of Monetary Economics*, 53(8):1761–1800.
- Shah, D. V., Watts, M. D., Domke, D., Fan, D., and Fibison, M. (1999). News coverage, economic cues, and the publics presidential performance, 1984-1996. *Journal of Politics*, 61:914–943.
- Sims, C. (2003). Implications of rational inattention. *Journal of Monetary Economics*, 50(3):665–690.