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Households' disagreement on inflation expectations and socioeconomic media exposure in Germany

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Non-technical summary

It is well known from international studies that households with low income and low education, females, unemployed, and young and old individuals have higher inflation expectations and forecast errors compared to other households. Whereas the reasons for these expectation differentials are still up to debate in the economic literature, economic policy will be affected through various channels.

First, allowing for heterogeneity of expectations has found to to be important to explain stylized facts such as the hump-shaped response of output and inflation to monetary policy shocks. Second, anchoring agents' inflation expectations might call for different communication strategies of central banks if households persistently form expectations in different ways. Third, rising disagreement on the future path of prices might be a sign of uncertainty with possible effects on economic risk-taking. And fourth, if some demographic groups tend to have forecast errors that are persistently above average, this might call for economic policies mitigating the resulting effects on the distribution of wealth and income.

In this paper, we propose that in Germany, expectation differentials of households with regard to income, age, and occupation can be explained by different group-specific inflation rates and socioeconomic media consumption. From 1999-2010, we analyze the links between households' inflation expectations and inflation rates, as well as the news coverage of inflation in 10 different news sources.

We observe that also in Germany, inflation expectations are higher for households with low income, for young households and for the unemployed. Moreover, the same types of households show larger deviations from the best available forecast, which we proxy with professional forecasters' expectations. We find that the higher expectation gaps of young and old households as well as the rising deviation with lower income levels can be explained by higher inflation rates of these groups, while no such effect can be observed for occupation groups. With regard to the news media, we observe considerable heterogeneity in news consumption of different newspapers and TV news shows for income, age and occupation groups. It thus seems that media coverage offers some explanation on why households with a different socioeconomic background disagree on the future path of prices. Depending on whether different media report negatively or positively about inflation, this will narrow or widen the gap between experts' inflation forecasts and households' inflation expectations.

Nicht-technische Zusammenfassung

Aus internationalen Studien ist bekannt, dass Haushalte mit niedrigem Einkommen und geringerer Bildung, Frauen, Arbeitslose, sowie junge und ältere Menschen in der Regel höhere Inflation in der Zukunft erwarten, und außerdem größere Fehler bei der Einschätzung zukünftiger Preissteigerungen begehen. Während in der Literatur weitgehend Unklarheit über die Gründe für diese systematischen Unterschiede besteht, so wird die Wirtschaftspolitik hierdurch in vielerlei Hinsicht beeinflusst.

Zum einen kann die typische (U-förmige) Reaktion von Inflation und Wirtschaftswachstum auf geldpolitische Entscheidungen in makroökonomischen Modellen reproduziert werden, wenn man beachtet, dass sich die Inflationserwartungen zwischen verschiedenen Gruppen unterscheiden. Daneben muss die Verankerung der Erwartungen am Inflationsziel der Zentralbank möglicherweise über unterschiedliche geldpolitische Kommunikationsstrategien erreicht werden, wenn Haushalte systematisch verschiedene Erwartungen bilden. Außerdem können wachsende Unterschiedene in den Erwartungen als Zeichen für ökonomische Unsicherheit und Risikoeinschätzungen interpretiert werden. Schließlich stellen sich auch Verteilungsfragen hinsichtlich Einkommen und Vermögen, wenn einzelne Bevölkerungsgruppen die Inflationsrate systematisch schlechter vorhersagen als andere.

In unserem Diskussionspapier untersuchen wir, ob sich in Deutschland die Abhängigkeit der Inflationserwartungen von Einkommen, Alter und Beschäftigungsstatus mittels haushaltsspezifischen Inflationsraten und unterschiedlichem Medienkonsum erklären lässt. Hierzu analysieren wir von 1999-2010 die Erwartungen und Inflationsraten von Haushalten, sowie die Berichterstattung über Inflation in 10 verschiedenen Medien.

Wir stellen fest, dass auch in Deutschland Haushalte mit niedrigerem Einkommen und niedrigerem Alter, sowie Arbeitslose höhere Inflationserwartungen aufweisen. Dieselben Gruppen weichen außerdem am stärksten von der besten verfügbaren Inflationsprognose ab, die wir mit den Erwartungen professioneller Prognostiker gleichsetzen. Die höheren Erwartungslücken jüngerer und älterer Haushalte, sowie von Niedrigeinkommensbeziehern können dadurch erklärt werden, dass diese Gruppen überdurchschnittlich hohen Preissteigerungen ausgesetzt sind, wohingegen sich für Beschäftigungsgruppen kein solcher Effekt finden lässt. Darüber hinaus finden wir beträchtliche Unterschiede in der Wirkung der Medienberichterstattung auf die verschiedenen Haushaltsgruppen, woraus wir schließen, dass die Medienberichterstattung einen robusten Erklärungsbeitrag für die Unterschiede in den Inflationserwartungen leistet. Je nachdem in welchen Medien wie (negativ oder positiv) über Inflation berichtet wird, kann dies die Lücke zwischen Expertenmeinung und Haushaltserwartung unterschiedlich beeinflussen.

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HOUSEHOLDS' DISAGREEMENT ON INFLATION EXPECTATIONS AND SOCIOECONOMIC MEDIA EXPOSURE IN GERMANY*

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Abstract

Inflation expectations are often found to depend on socioeconomic and demographic characteristics of households, such as age, income and education, however, the reasons for this systematic heterogeneity are not yet fully understood. Since accounting for these expectation differentials could help improve the communication strategies of central banks, we test the impact of three sources of the demographic dependence of inflation expectations using data for Germany. Overall, our findings suggest that household-specific inflation rates and group-specific news consumption accounts for the higher expectation gaps of younger and older households, households with lower income and unemployed survey respondents, while households' inflation perceptions only play a minor role.

Keywords: Inflation Expectations and Perceptions, Demographic Heterogeneity, News Media Effects, Household-Specific Inflation Rates, System Estimation

JEL classification: C53, D84, E37

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1 Introduction

The reasons why households with low income and low education, females, unemployed, and young and old individuals have higher inflation expectations and forecast errors compared to other households are still unclear. Some studies propose that these expectation differentials arise from different consumption baskets, while others suggest that they simply reflect differences in financial literacy. In this paper, we explore another driving force of the demographic heterogeneity of inflation expectations, namely the impact of news media coverage. Models of sticky information (Mankiw and Reis, 2002a) and rational inattention (Sims, 2003) propose that households' inflation expectations in the long run move in line with the best available forecast in the economy. In the short run, however, consumers' expectations may deviate considerably from the best available forecast, since the costs of gathering and processing this forecast might be too high. Carroll (2003) has argued that the news media can strengthen the link between households' and professional forecasters' expectations: the more articles published about inflation, the higher the likelihood that consumers get to know the best available forecast.

Carroll's epidemiology model of expectation formation relies on three crucial assumptions. First, households possess equal capacity of understanding and processing the media articles. Second, all agents have the same reading propensity, and third, all media sources report on inflation in a similar vein. Each of these assumptions can be questioned, and relaxing them might help explain demographic differences in inflation expectations. Regarding households' processing capacities, studies on financial literacy (Lusardi and Mitchell, 2008, Bruine de Bruin, van der Klaauw, Downs, Fischhoff, Topa, and Armantier, 2010) show that the accuracy of inflation expectations depends on demographic characteristics of individuals. Hence, even in times of high news coverage, some households might still deviate from the best available forecast, if they have difficulties to understand media reports and thus do not incorporate the latest available information. Second, reading propensities differ considerably across households (Schoenbach, Lauf, McLeod, and Scheufele, 1999), a feature that Carroll (2003) himself has already tried to take into account. Third, the various news media cover inflation in a different way. Anecdotal evidence indicates that the yellow press as well as TV channels with a focus on entertainment devote less space to inflation in ordinary times, but increase their coverage significantly and in an often exaggerated way if something unusual happens. By contrast, state-funded TV channels seem to report on a more regular and accurate basis on inflation. It is the aim of this paper to relax these three assumptions and to test whether allowing for socioeconomic news coverage can help explain the demographic differences in inflation expectations often found in the literature.

Besides the news media and professional forecasters' expectations, households rely on further sources of information to build their expectations. According to the "availability hypothesis" (Tversky and Kahneman, 1973), households tend to have a better memory for prices they pay more frequently. Hence, if people are asked for their expectations about future price developments, it is not clear whether they refer to CPI inflation reported in the media or to prices they encounter in their everyday life. We take this into account by computing household-specific inflation rates that closely match typical spending patterns of the demographic groups in our data set. Furthermore, at the moment people state their expectations, they might not remember exactly the entire price changes of their household-specific goods basket, but only prices that have risen a lot. We account for this selective perception by including households' nowcast of the current inflation rate, the so-called inflation perceptions. Overall, we thus simultaneously explore three sources of expectation differentials: media effects, inflation rates, and inflation perceptions. For reasons of data availability, we use monthly survey data for German households' inflation expectations distinguishing between age, income and occupation groups together with 10 different news media sources over the time span January 1999 - March 2010.

Accounting for the determinants of the heterogeneity of inflation expectations is important for a number of reasons. As it has been nicely summarized by Gnan, Langthaler, and Valderrama (2011), if expectations differ among agents, this will affect economic policy through various channels. First, heterogeneity of expectations has found to be important to explain stylized facts such as the hump-shaped response of output and inflation to monetary policy shocks (Mankiw and Reis, 2006). Second, anchoring agents' inflation expectations might call for different communication strategies of central banks if households persistently form expectations in different ways (Sims, 2009). Third, as it is argued by Bomberger (1996), rising disagreement on the future path of prices might be a sign of uncertainty with possible effects on economic risk-taking. Fourth, if expectations affect current inflation as it is the case in the forward-looking New Keynesian Phillips Curve, does this relationship change if there is considerable heterogeneity in expectations? Finally, if some demographic groups tend to have forecast errors that are persistently above average, this might call for economic policies mitigating the resulting effects on the distribution of wealth and income (Doepke and Schneider, 2006).

Our paper makes the following contributions. First, in line with previous findings in the literature, we observe that inflation expectations depend on demographics also in Germany, albeit differences are not that large. Inflation expectations are higher for households with low income, for young households and for the unemployed. Moreover, the same types of households show larger deviations from the best available forecast, which we proxy with

professional forecasters' expectations. Besides of deviating more in absolute terms, these household-groups also show larger fluctuations with regard to experts' expectations. Second, we try to explain these demographic differences with household-specific inflation rates, inflation perceptions and news coverage. We find that the higher expectation gaps of young and old households as well as the rising deviation with lower income levels can be explained by higher inflation rates of these groups, while no such effect can be observed for occupation groups. Across all household groups, inflation perceptions do not play a role in determining inflation expectations. With regard to the news media, we observe considerable heterogeneity in news consumption of different newspapers and TV news shows for income, age and occupation groups. It thus seems that media coverage offers some explanation on why households with a different socioeconomic background disagree on the future path of prices. Furthermore, we find that constructing an index of news reports by aggregating all available newspaper and TV reports can be misleading. Coverage of inflation in *Tagesschau*, Germany's most influential TV evening news show, is found to increase the gap between households and professional forecasters, while a rising number of articles published in *BILD*, Germany's most prominent tabloid, brings households closer to the best available forecast. Finally, it is important to distinguish between the effects of a rise in the number of news reports (volume channel) and a change in the journalists' judgment of inflation (tone channel). Whereas households' expectation gaps increase if *BILD* presents inflation in a negative way thereby possibly inducing a media bias, more negative coverage in *Tagesschau* narrows the gap between households and professional forecasters.

We start our paper with a short description of Carroll (2003)'s epidemiology model and its application to the demographic dependence of households' inflation expectations. We then describe the data set and our estimation strategy, before presenting our results and discussing directions for further research. A detailed literature summary of the different sources of households' disagreement on inflation expectations that have been proposed in the literature is provided in the Appendix.

2 The Dependence of Inflation Expectations on Socioeconomic Characteristics

It is a robust finding in the empirical literature that inflation expectations depend on households' socioeconomic background. Among other characteristics, high-income households and better educated individuals tend to report lower expectations, the unemployed generally state higher expectations, and young and old households expect inflation to be

higher compared to middle age households. Expressed formally, for different households groups j, we observe:

$$\pi_{j,t+1}^{exp,hh} = f\begin{pmatrix} income & education & unemployed & age \\ (-) & (-) & (+) & (+/-) \end{pmatrix} \quad (1)$$

This pattern is found in various studies for different countries, different time periods and for both qualitative and quantitative surveys (Bryan and Venkatu, 2001b,a, Blanchflower and MacCoille, 2009, Bruine de Bruin et al., 2010). We offer a detailed survey of the evidence in the Appendix (A.1).

Besides expecting higher inflation in absolute terms, the same groups of households also make larger forecast errors:

$$e_{j,t+1} = f\begin{pmatrix} income & education & unemployed & age \\ (-) & (-) & (+) & (+/-) \end{pmatrix}, \text{ where } e_{j,t+1} = \pi_{j,t+1}^{exp,hh} - \pi_{t+1} \quad (2)$$

Evidence has been provided for example by Souleles (2004) for the US, Blanchflower and MacCoille (2009) for the UK, and Leung (2009) for New Zealand. Since no such study has been conducted for Germany, it is the first goal of this paper to establish comparable evidence using German data.

A number of different explanations have been proposed in order to explain this pattern, such as different degrees of financial literacy across households (Burke and Manz, 2011, Bruine de Bruin et al., 2010), household-specific inflation rates (Jonung, 1981, Bryan and Venkatu, 2001a) or household-specific inflation perceptions (Blanchflower and MacCoille, 2009). However, a systematic summary of the literature, which is provided in Appendix (A.1), reveals that most studies only test one explanation at a time, without assessing the possible impact of alternative reasons of why households' inflation expectations systematically depend on their socioeconomic background. For this reason, we try to test simultaneously as many of the proposed explanations as possible, in order to assess their relative importance. Furthermore, we add to the literature by suggesting that household-specific news consumption is responsible for the socioeconomic differences in inflation expectations.

The role of news reports in shaping households' belief about future inflation has originally been emphasized by Carroll (2003). According to his epidemiology model, only a fraction λ of households forms expectations in line with the best available forecast $E_t[\pi_{t+1}]$, whereas the remaining part $1-\lambda$ sticks to their beliefs built in the previous period. Thus,

the mean expectations computed across all households is given as a weighted average:

$$\pi_{t,t+1}^{exp,hh} = \lambda E_t[\pi_{t+1}] + (1-\lambda)\pi_{t-1,t}^{exp,hh} \tag{3}$$

Next, Carroll (2003) assumes that households think that experts are better in forecasting inflation than themselves. Thus, one can use the average of the inflation expectations provided by professional forecasters, $\pi_{t,t+1}^{exp,prof}$, as a proxy for the best available forecast in the economy. And, since households get to know experts' expectations via reading newspapers or watching television, this suggests that news coverage is an important driver of households' inflation expectations.[1]. If the media report a lot about inflation, this increases the probability that households receive this information and subsequently update their expectations to expert forecasts that are often quoted in the news. Note that models of sticky information (Mankiw and Reis, 2002b) and rational inattention (Sims, 2003) imply a similar role of the news media. According to these models, households do not form expectations rationally if the costs of gathering and processing information are too high. Instead, they receive the most recent inflation forecast from following the news media, whereas in times of large media coverage of inflation, households face lower search costs and are thus quicker to adjust to expert forecasts. Expressed formally, the epidemiology model allowing for an effect from news coverage is given as:

$$GAPSQ_t = \alpha_0 + \alpha_1 News_t \tag{4}$$

where $GAPSQ_t \left(\pi_{j,t}^{exp,hh} - \pi_t^{exp,prof}\right)^2$ is the squared difference of households' expectations and the expectations of professional forecasters.[2] Following the epidemiology model or models of sticky information, one would expect a negative news effect, i.e. more newspaper articles or television reports should lower the gap between experts and households. This model can be related to the question on demographic differences in inflation expectations by assuming that households have different reading propensities resulting in household-specific news effects:

$$GAPSQ_{j,t} = \alpha_{j,0} + \alpha_{j,1} News_t \tag{5}$$

In the working paper version of his paper, Carroll (2001) argues in favor of such heterogeneous news effects. If, for example, low-income households have a lower reading

[1]Supportive evidence for the role of news in explaining inflation expectations is provided by Carroll (2003), Draeger (2011) Lamla and Lein (2010), and Menz and Brandt (2012), whereas Pfajfar and Santoro (2013) do not find significant news effects.

[2]Using the absolute gap instead of the squared gap does not change the results qualitatively.

propensity, a rise in news coverage of inflation would have a lower effect on this group compared to the remaining income groups. According to Schoenbach et al. (1999), in Germany, males, older households, better educated and households with higher income read newspapers more frequently compared to others. As a result, the expectation gap of low income households will be larger, since they are less likely to update to the best available forecast in the economy. We thus take the epidemiology model allowing for different news effects across households as the starting point for our analysis of demographic differences in inflation expectations. Note that arguing in terms of "expectation gaps" instead of "forecast errors" or "absolute values of inflation expectations" does not affect our general conclusions: As we will show below, those household groups that express the highest inflation expectations are generally the same that make the largest forecast errors and also show the largest expectation gaps. Moreover, we will take the perspective of households throughout the paper. While it has been shown that experts occasionally also adjust to households, the expectation gap of households and experts is mainly driven by households adjusting to experts (Menz, 2013b). Keeping this in mind, we state a first testable hypothesis:

Hypothesis 1 *The extent to which households adjust to experts when forecasting inflation depends negatively on the amount of news coverage on inflation. The larger expectation gaps of some household groups result from lower news effects due to different reading propensities.*

In what follows, we relax and test a number of assumptions of the epidemiology model expressed in terms of group-specific expectation gaps. So far, the baseline version in equation (5) assumes that the effect of news coverage is the same for all different newspapers and television shows. For the purpose of explaining socioeconomic news consumption, this assumption is too restrictive, given that households of different age, income, or occupation prefer different news sources. Thus, distinguishing between various print and TV media, our second hypothesis is given as

Hypothesis 2 *Households react differently to different news sources, depending on their socioeconomic characteristics.*

Next, it is important not only to account for the amount of news coverage, but also for its tone. Gentzkow and Shapiro (2010), among others, show that the media "slant" the news, i.e. certain news are discussed more prominently and in a different light than others, depending *inter alia* on readers' initial beliefs. In the context of inflation expectations, Lamla and Lein (2010) and Draeger (2011) report evidence that households react strongly to news on inflation if articles are written in a negative tone, i.e. if journalists

argue that current or future inflation is a serious problem for the economy. Again, we expect households to react differently to media slant, depending on their socioeconomic background. For example, better educated households could be less receptive for overly negative newspaper articles, whereas younger households with less personal experience might react more strongly to negative news reports. Thus, we state our third hypothesis as

Hypothesis 3 *Households do not only react to the amount of news coverage but also to its tone. Depending on the demographic background, negative news on inflation are perceived differently than positive news.*

Finally, the epidemiology model excludes some factors that possibly affect households' inflation expectations. Since we ultimately want to explain the demographic differences in expectation gaps, we have to account for at least three more variables that have been proposed in the literature as determinants of socioeconomic disagreement in inflation expectations.

First, as it is argued by Akerlof, Dickens, and Perry (1996, 2000), the heterogeneity of households' inflation expectations depends negatively on the level of the overall inflation rate. Mankiw, Reis, and Wolfers (2003) for the US and Gnan et al. (2011) for Euro Area countries present supportive evidence for the near-rationality hypothesis of Akerlof. Furthermore, the epidemiology model has been criticized for excluding adaptive expectation formation. Instead of sticking to their own past expectations, non-updating households could simply adjust to the most recent inflation rate (Luoma and Luoto, 2009) . However, we expect that the inflation rate does not have the same effect on all households. If high-income households are more forward-looking than low-income households, a positive increase of inflation should have a lower impact on households at the top of the income distribution. Therefore, we test a fourth hypothesis:

Hypothesis 4 *Households' do not only adjust to the best available forecast or stick to their own past expectations, but they also react positively on the actual inflation rate. The effect varies with households' socioeconomic background: The larger expectation gaps of some households might be due to a larger degree of adaptive expectation formation.*

However, it is not obvious that households have the official inflation rate in mind when forming expectations about future prices. Instead, they might refer to price changes of a consumption bundle which is more closely linked to their own spending behavior. And as it has been argued by various authors beginning at least with Michael (1979), households with low income, low education, and the elderly face above average inflation rates. Thus, our next hypothesis is given as

Hypothesis 5 *Households mainly react to their group-specific inflation rates instead of overall inflation. Since households with different demographic characteristics face systematically different inflation rates, the effect of price changes on expectation gaps will vary as well.*

Finally, research in psychology shows that households have difficulties in recalling prices they have paid, even of goods they have bought only recently (Ranyard, Del Missier, Bonini, Duxbury, and Summers, 2008). If this is true, households would not base their expectations on actual group specific inflation rates, but instead use an own estimate of past prices, the so-called perceived inflation rate. Since the ability to remember past prices varies with the age of households, or since low income households will face a greater need to remember prices, we would also expect group-specific effects from perceived inflation. Hence, we test a final hypothesis:

Hypothesis 6 *Instead of overall inflation or group-specific inflation, households use an own estimate of past price changes, the perceived inflation rate, to form expectations. Since the ability and necessity to remember past prices can be related to demographics, we expect that the impact of perceived inflation varies across households.*

Summing up, we test an extended version of the baseline epidemiology model:

$$GAPSQ_{j,t} = f_i\left(News_{i,t}, \pi_t, \pi_{j,t}, perc_{j,t}\right) \tag{6}$$

Here, $News$ captures either the total amount of media coverage about inflation or its tone, for different media sources i, π_t is the actual inflation rate, $\pi_{j,t}$ gives the inflation rate corresponding to household j, and $perc_{j,t}$ denotes household-specific inflation perceptions.

3 Data

This section describes the data on household-specific inflation expectations and perceptions, group-specific inflation rates, professional forecasters' expectations and news coverage. Overall, our sample covers the period 1999M1-2010M3. All data sources can be found in Table (9) in the Appendix.

The household-specific inflation expectations and perceptions are taken from the Consumer Survey conducted by the European Commission (EC), whereas household-specific inflation rates are derived using data from Eurostat. Unfortunately, the demographic categories of the EC survey do not match entirely with the categories used to compute

household-specific inflation rates. In Table (1), we show the categories that are possible to merge, namely *age*, *income*, and *occupation*. Even if the classifications are slightly different, we think that this should not affect the results too much. It is not possible to include education, since no data is available for household-specific inflation rates.

Table 1: Match of Demographic Groups

HH-Expectations (EC)	HH-Inflation (Eurostat)	Variable Label
total	total inflation	macro
Age Groups		
16-29	0-30	ylt30
30-49	30-44	y3044
50-64	45-59	y4559
65+	60+	yge60
Income Groups		
1st quartile	1st income quintile	inc1
2nd quartile	2nd income quintile	inc2
3rd quartile	4th income quintile	inc3
4th quartile	5th income quintile	inc4
Occupation Groups		
skilled manual workers	manual workers in industry and services	wman
self employed and professional	self-employed	wfree
unemployed	unemployed	wune

3.1 Household-specific Inflation Expectations

The Consumer Survey of the European Commission consists of qualitative data. Each month, a random sample of households in different European countries is asked the following question: "By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months?". Respondents can choose between six answer categories: "rise a lot", "rise moderately", "rise slightly", "stay about the same", "fall", "don't know". The EC publishes the resulting response fractions, both on the aggregate household level and for different demographic groups. Unfortunately, the underlying micro data is not available.

For the purpose of explaining the expectation gaps of different households, we need to quantify the qualitative survey responses using the probability method proposed by Carlson and Parkin (1975). The use of this method has been sometimes criticized in the literature, as for example recently by Breitung and Schmeling (2013). However, since we only have qualitative data at hand, we have no choice but to accept the disadvantages

of the probability method. Since a detailed discussion of the quantification procedure is beyond the scope of this paper, we propose a brief description in the Appendix (A.2). At the moment, it suffices to stress that the probability method has to assume a probability distribution and a scaling parameter. For the former, we use the normal distribution, whereas for the latter, we could either use the aggregate inflation rate, as it is usually done in the literature, or household-specific inflation rates.[3] Using the official inflation rate assumes that survey participants refer to the overall price development at the time they answer the questionnaire. However, if individuals base their inflation expectations on past price changes of those goods categories they are more familiar with, it might be more appropriate to employ household-specific inflation rates in the quantification process. Since the EC survey only refers to "consumer prices" instead of "prices in general" or "inflation rate", both versions are possible. Hence, the choice of the appropriate inflation rate used to scale households' qualitative expectations is an empirical question. We thus calculate the recursive HP-filter over 20 months prior to each survey date, using both aggregate inflation and household-specific inflation.[4]

In Table (2), we compare the mean, the standard deviation, and the root mean squared error of households' quantified inflation expectation. The results suggest that households tend to base their expectations on group-specific inflation: for all households, the RMSE's are lower if we quantify the qualitative answers with household-specific inflation (columns (3) and (4)) compared to aggregate inflation (columns (7) and (8)). Furthermore, households are better in predicting changes in the aggregate price level rather than changes of their group-specific inflation rate. Thus, it seems that households participating in the survey refer to overall inflation but evaluate the expected changes against their group-specific inflation rate. Hence, in the remaining part of the paper, we use group-level inflation rates to quantify inflation expectations.[5]

[3]The construction of household-specific inflation rates is described in the next section.
[4]The results do not change much if we use different lags to calculate the HP-filter.
[5]Results are qualitatively similar if we employ overall inflation.

Table 2: Results: Forecast Errors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	hh-inflation				aggregate inflation				GAPSQ			
	mean	sd	$RMSE$ $\pi_{j,t}$	$RMSE$ π_t	mean	sd	$RMSE$ $\pi_{j,t}$	$RMSE$ π_t	$mean$ $\pi_{j,t}$	sd $\pi_{j,t}$	$mean$ π_t	sd π_t
prof	1.497	0.471	0.944	.	.	.	.	.	.	.	.	.
all	1.118	0.442	1.122	1.122	1.118	0.442	1.122	1.122	0.309	0.303	0.309	0.303
ylt30	1.144	0.449	1.171	1.094	1.074	0.418	1.198	1.125	0.273	0.258	0.345	0.316
y3044	1.203	0.478	1.187	1.089	1.106	0.437	1.218	1.124	0.231	0.233	0.310	0.298
y4559	1.253	0.500	1.166	1.066	1.144	0.458	1.208	1.116	0.213	0.232	0.293	0.299
yge60	1.283	0.509	1.177	1.051	1.152	0.464	1.238	1.129	0.213	0.246	0.301	0.312
inc1	1.264	0.548	1.255	1.104	1.168	0.471	1.270	1.121	0.272	0.329	0.291	0.304
inc2	1.226	0.514	1.192	1.100	1.148	0.467	1.216	1.128	0.253	0.283	0.292	0.299
inc3	1.237	0.482	1.169	1.075	1.132	0.445	1.213	1.126	0.219	0.240	0.301	0.306
inc4	1.240	0.471	1.151	1.035	1.102	0.435	1.214	1.116	0.181	0.177	0.310	0.302
wman	1.221	0.460	1.152	1.064	1.123	0.426	1.190	1.108	0.218	0.231	0.302	0.298
wfree	1.209	0.481	1.164	1.073	1.100	0.441	1.207	1.123	0.224	0.222	0.316	0.305
wune	1.296	0.540	1.267	1.101	1.179	0.465	1.288	1.125	0.227	0.268	0.270	0.276

Note: Sample: 1999M1-2010M3. RMSE is the root mean squared error of inflation expectations and actual inflation 12 months ahead, π_t denotes aggregate inflation and $\pi_{j,t}$ is the representative inflation rate of household-group j. $GAPSQ$ is the squared difference between households' and professional forecasters' inflation expectations.

Next, we check whether the general findings with regard to the demographic expectation differentials also hold in Germany.[6] Overall, the differences of quantified inflation expectations are relatively minor across demographic groups, which might be due to fact that we can only use group level data instead of micro data.[7] Still, the summary statistics in Table (2) reveal pattern in households' inflation expectations that are similar to those reported in the literature. The older the households, the higher their expectations. Unemployed people have higher expectations than manual workers and self-employed. With regard to the income differentials, the results are less clear-cut. In accordance with the literature, the poorest households have the highest inflation expectations. However, moving from the second income quartile to the fourth quartile, we observe rising inflation expectations, but, turning to the RMSE, households' forecast error constantly falls with rising income. Whereas the unemployed are considerably worse in forecasting their group-specific inflation compared to manual workers and self-employed, no clear pattern emerges for age groups.

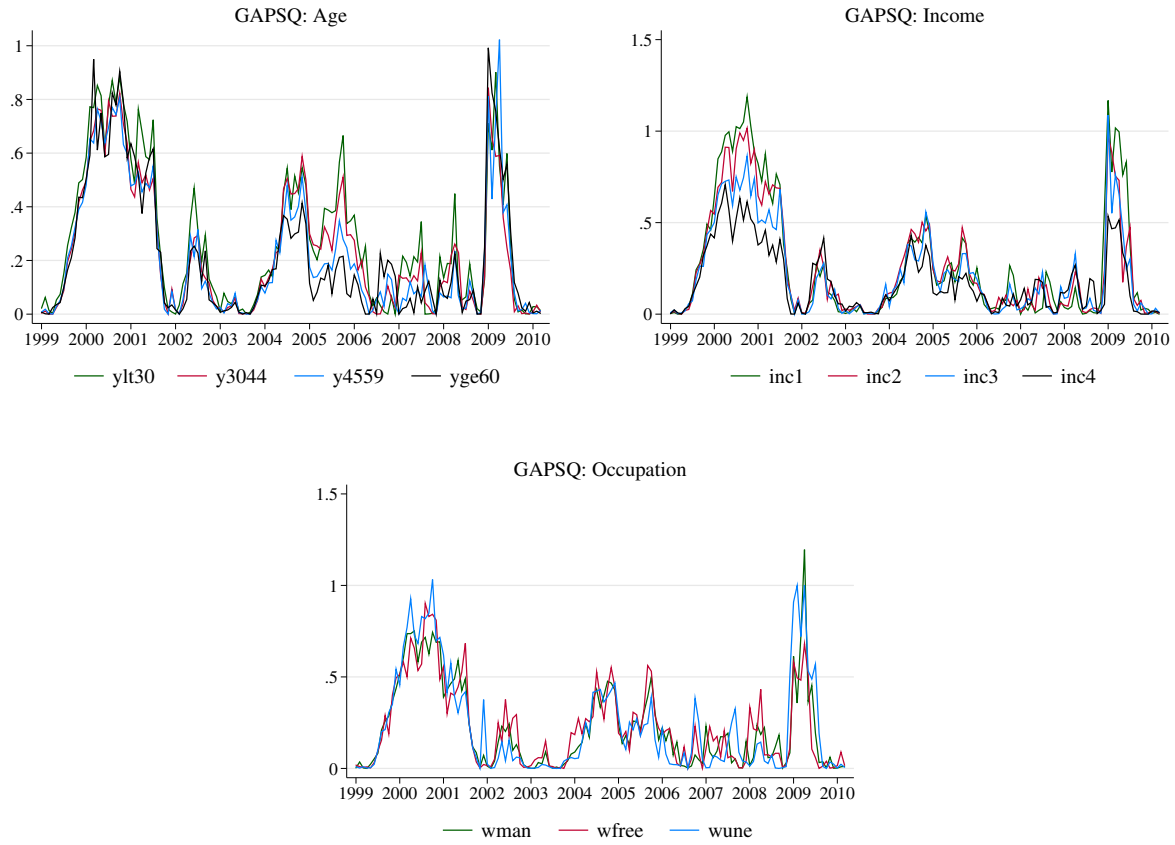
Comparing household expectations with expert expectations, the demographic pattern

[6]We plot households' quantified inflation expectations in Figure (5) in the Appendix.

[7]Moreover, Gnan et al. (2011) report marked differences between European countries: Whereas the within-group disagreement does not differ much between household-groups in France, Germany, and Slovakia, the remaining Euro Area countries exhibit much larger deviations.

becomes more explicit. First, we get lower expectation gaps if we quantify households' expectations using group specific inflation (column (9)) compared to aggregate inflation (column (11)). Second, the expectation gaps are larger if households are unemployed, belong to low-income groups, or to the youngest age group. Plotting the expectation gaps for each household groups in Figure (1) also shows some variation over time, with the largest gaps in 2000/2001 and 2009.

Figure 1: The Expectation Gaps of Households



3.2 Household-specific Inflation Rates and Perceptions

The household-specific inflation rates are taken from Colavecchio, Fritsche, and Graff (2011). The authors compute fictitious group-specific inflation rates by combining household expenditure patterns from the Household Budget Surveys (HBS) of the European Commission with the harmonized inflation rates for different goods categories according to the "Classification of Individual Consumption by Purpose (COICOP)". We refer to their paper for a detailed description.

As we have mentioned above, we use these household-specific inflation rates for the quantification of inflation expectations on the group level. Moreover, we can test whether households react to changes in overall inflation or to price changes that are closer related to their group-specific spending patterns. However, when forming their expectations, households could also use their estimates of current inflation as a benchmark. This perceived inflation rate can be computed from the EU Consumer Survey as well. In addition to asking households to state their beliefs on future prices, the survey includes a question on perceived inflation: "How do you think that consumer prices have developed over the last 12 months?", offering respondents the same answer categories as for the expectation series. Again, we apply the probability method as described in Appendix (A.2) to quantify the qualitative perception series.

3.3 Media Data

The media data is compiled by the media research institute *Media Tenor*[8]. Newspaper articles and television reports are searched for the keywords "inflation", "deflation", "price increase", "price cut", "price stability" and "oil price", followed by a human-based content analysis of the news reports that have been picked up. This detailed coding allows us, for example, to distinguish reports with a main focus on Germany from reports that mention inflation in other countries. In total, ten different media sources are included, ranging from one national daily newspaper (*BILD*), over two national weekly magazines (*Der Spiegel*, *Focus*) to seven evening news shows on TV (*Tagesschau*, *Heute*, *Heute Journal*, *Tagesthemen*, *SAT1 18:30*, *RTL Aktuell*, and *Pro7 Nachrichten*).

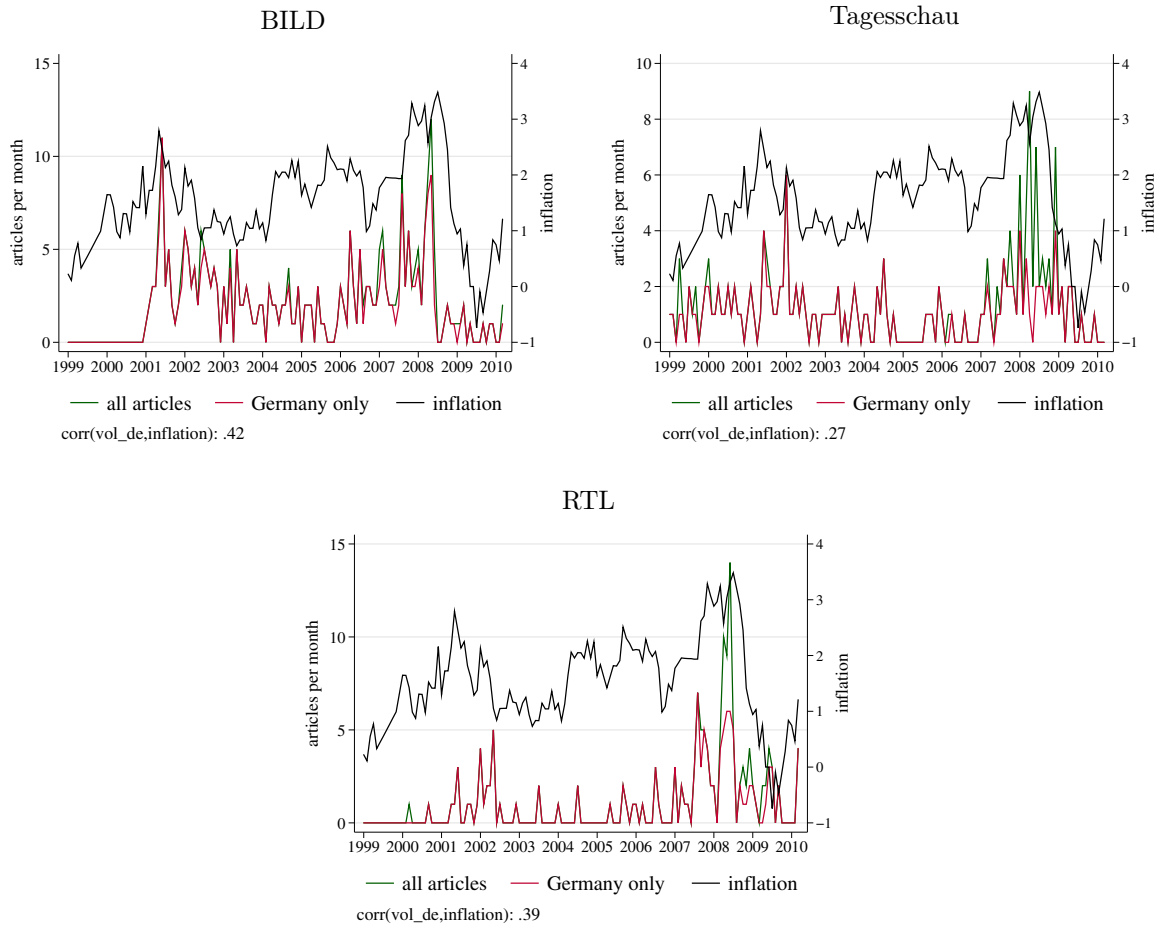
In what follows, we mainly focus on the daily newspaper *BILD*, the most important public news broadcast *Tagesschau* and the most influential private channel *RTL*, in order to keep the exposition tractable. The monthly sum of newspaper articles and TV reports of these news sources are shown in Figure (2), together with the annual inflation rate and distinguished between all articles and news reports that deal only with Germany.[9]

[8] http://www.mediatenor.com/

[9] The graphs for the remaining news media can be found in Figure (7) in the Appendix.

Overall, the media follow a similar trend: news coverage tends to peak in 2002M1 and 2008M1 across all media. In addition, most of the articles and TV reports deal with inflation in Germany, the only exception being the period of the financial crisis. Still, there are differences between media sources. The daily tabloid *BILD* covers inflation in nearly every month, whereas the public evening news show *Tagesschau* covers inflation on a more regular basis than the private TV channel *RTL*. Accordingly, the correlation of news coverage with annual inflation varies between single media sources. Whereas news coverage in *Tagesschau* has a correlation coefficient of .27, *BILD* and *RTL* react slightly stronger to inflation.

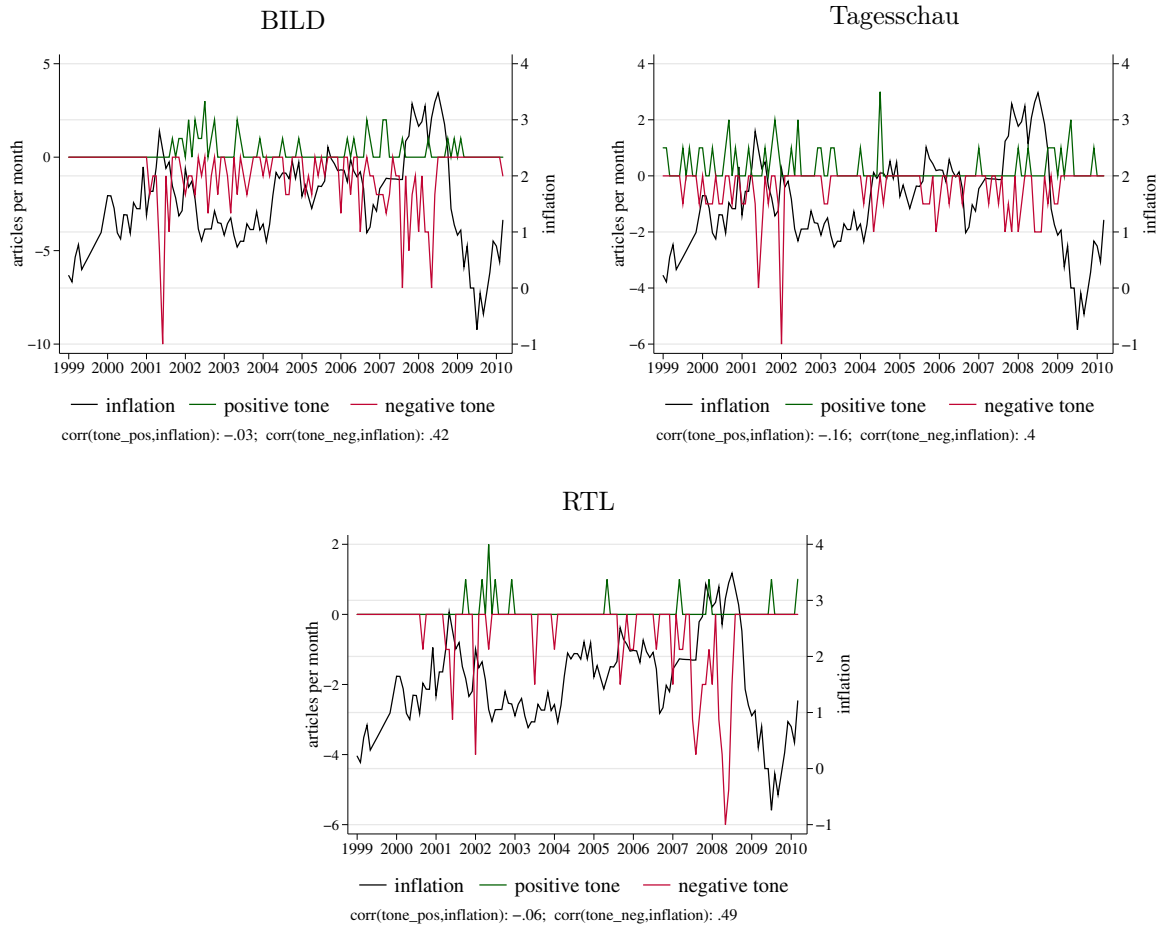
Figure 2: Media Coverage I: Number of News Reports About Inflation per Month



Besides the total amount of news coverage, our media data set also allows us to include a tone variable, which can be captured via the *valuation* and the *context* of an article. The valuation of an article is more narrowly defined. As an example, a statement such as "hyperinflation destroys the savings of citizens" would be coded as negative valuation. In addition, the context of an article takes into account a broader judgment. For example, the sentence "inflation has been consistently higher than in other OECD countries" receives a

negative context in the coding. These classifications can depend on the interpretation of the individual coder, however, *Media Tenor* reports to have a high intercoder reliability. In the following, we only plot the number of positive and negative articles using the context variable since the single news media only show very low numbers of news reports with a narrowly defined judgment (valuation). As it is shown in Figure (3), we generally observe a rising number of negative reports and a drop in the number of positive articles if inflation rises.[10] With regard to the heterogeneity of news coverage, on average, *Tagesschau* has the most balanced coverage about inflation topics in terms of valuation as well as context. The tabloid *BILD*, by contrast, mostly covers inflation with a negative tone.

Figure 3: Media Coverage II: Number of Negative and Positive News About Inflation per Month



[10]This picture also holds for the remaining news media, see Figure (8).

4 Estimation Strategy

As regards the estimation, we start with specifying a baseline version of the epidemiology model in equation (6), i.e. for different household groups, we explain the squared gap between households' inflation expectations and experts' forecast, with overall and household-specific inflation rates, inflation perceptions and news media variables.
In a first set of equations, we test the **Hypothesis 1**, i.e. we evaluate whether the impact of the overall number of newspaper articles $News_t^{print}$ and the number of TV reports on inflation $News_t^{tv}$ differs across household groups. Furthermore, we simultaneously test **Hypothesis 4 - 6** by including overall and household-specific inflation as well as household-specific inflation perceptions. Thus, for each age group, income group and occupation group j, we estimate

$$\begin{aligned} GAPSQ_{j,t} = \alpha_{j,1} + \alpha_{j,2}\pi_{t-1} + \alpha_{j,3}News^{print} + \alpha_{j,4}News^{tv} + \alpha_{j,5}\left(\pi_{j,t} - \pi_t\right) \\ + \alpha_{j,6}\left(perc_{j,t} - perc_t\right) + \varepsilon_{j,t} \end{aligned} \tag{7}$$

Three points have to be mentioned. First, we follow Anderson, Becker, and Osborn (2010) and include the overall inflation rate π_t with its first lag to take into account that the official price statistic is only released with a delay of one month. Second, we do not use the raw series of household-specific inflation rates and perceptions, but calculate the deviations of group-specific inflation rates from aggregate inflation rate, $\pi_{j,t} - \pi_t$, as well as the difference between group-specific perceptions and aggregate perceptions, $\pi_{j,t}^{perc} - \pi_t^{perc}$.[11] By using price differentials, we belief to be closer to the underlying information processing of households: these might either increase their inflation expectations in response to rising aggregate inflation, or if their group-specific inflation deviates considerably from overall inflation. We include the contemporaneous value of inflation differentials assuming that households immediately realize price changes of their group-specific consumption bundle. Third, the news variables are computed as follows. For each month, we sum all articles that mention inflation in each of the 10 different news sources. Then, in order to account for the fact that the size of newspapers has been changing over time, we divide the monthly sums by their maximum value over the entire sample. Finally, for computing the overall number of newspaper articles $News_t^{print}$ and TV reports $News_t^{tv}$ we weight the single newspapers by their print run and the TV reports by the number of daily viewers.[12,13]

[11] The resulting series are shown in Figure (9) in the Appendix.
[12] In Figure (6) in the Appendix, we plot the average number of readers per newspaper issue and the average number of daily viewers of TV news shows.
[13] Correlation of the two news indexes only reaches .4, so there should be no multicollinearity problem.

Next, we disaggregate the news variables, and include the volume of inflation reports in *BILD*, *Tagesschau*, and *RTL* separately, thereby testing the **Hypothesis 2** stating that households of different socioeconomic background choose different news sources to get information about inflation. We choose to only include the three most important news sources in order to keep the estimation and interpretation tractable. The results remain the same if we use the entire media data set. Hence, equation (7) is modified such that

$$\begin{aligned} GAPSQ_{j,t} = \alpha_{j,1} + \alpha_{j,2}\pi_{t-1} + \alpha_{j,3}News_t^{Bild} + \alpha_{j,4}News_t^{Tag} + \alpha_{j,5}News_t^{RTL} \\ + \alpha_{j,6}\left(\pi_{j,t} - \pi_t\right) + \alpha_{j,7}\left(perc_{j,t} - perc_t\right) + \varepsilon_{j,t} \end{aligned} \tag{8}$$

Note that since we do not have data on the relative amount of time households spend watching television or reading the newspapers, we cannot weight the single media indexes. Next, we replace the volume of news media coverage with the tone of media reports thereby testing **Hypothesis 3**. We distinguish between the number of negative news $News^{neg}$ and positive news $News^{pos}$, and employ the two different codings used by *Media Tenor*, context *con* and valuation *val*. The news variables with a negative tone are highly correlated (.8), however, this hardly affects the results. The third equation is given as:

$$\begin{aligned} GAPSQ_{j,t} = \alpha_{j,1} + \alpha_{j,2}\pi_{t-1} + \alpha_{j,3}News^{pos\_con} + \alpha_{j,4}News^{neg\_con} + \alpha_{j,5}News^{pos\_val} \\ + \alpha_{j,6}News^{neg\_val} + \alpha_{j,7}\left(\pi_{j,t} - \pi_t\right) + \alpha_{j,8}\left(perc_{j,t} - perc_t\right) + \varepsilon_{j,t} \end{aligned} \tag{9}$$

Finally, we also use the disaggregated tone variables, regressing the expectation gaps on the number of news reports with a positive tone in *BILD*, *Tagesschau*, and *RTL* on the one hand, and on the media reports with a negative judgment on the other hand. Since single news media only show very low numbers of news reports if we classify the journalists' judgment in a narrow sense, we only employ the broader definition included in *context* in the estimation. Our final equations are thus given by:

$$\begin{aligned} GAPSQ_{j,t} = \alpha_{j,1} + \alpha_{j,2}\pi_{t-1} + \alpha_{j,3}News^{Bild\ con\ pos} + \alpha_{j,4}News^{Tag\ con\ pos} \\ + \alpha_{j,5}News^{RTL\ con\ pos} + \alpha_{j,6}\left(\pi_{j,t} - \pi_t\right) + \alpha_{j,7}\left(perc_{j,t} - perc_t\right) + \varepsilon_{j,t} \end{aligned} \tag{10}$$

The same is true for the correlation between household-specific inflation rates and inflation perceptions.

$$GAPSQ_{j,t} = \alpha_{j,1} + \alpha_{j,2}\pi_{t-1} + \alpha_{j,3}News^{Bild\ con\ neg} + \alpha_{j,4}News^{Tag\ con\ neg} + \alpha_{j,5}News^{RTL\ con\ neg} + \alpha_{j,6}\left(\pi_{j,t} - \pi_t\right) + \alpha_{j,7}\left(perc_{j,t} - perc_t\right) + \varepsilon_{j,t} \quad (11)$$

It is worth noting, at this point, that there are probably a number of feedback effects between the variables under investigation. Of particular importance, it might be fairly restrictive to treat media coverage as an exogenous variable for explaining households' expectations. Mullainathan and Shleifer (2005) and Gentzkow and Shapiro (2010) have argued that under certain conditions, newspapers slant their news coverage in the direction of the initial beliefs of their readers. Additionally, Menz (2013a) and Menz and Brandt (2012) have documented various feedback effects between inflation, expectations and news coverage. Therefore, we take a systems approach and model news coverage in each of the estimated equations as an endogenous variable. More precisely, we follow the results in Menz (2013a) and Menz and Brandt (2012) and relate media coverage to economic developments and agents' thoughts about the future:

$$NEWS_{i,t} = \beta_1 + \beta_2 NEWS_{i,t-1} + ... + \beta_6 NEWS_{i,t-5} + \beta_7\pi_t + \beta_8\pi_t^{exp,hh} + \beta_9\pi_t^{exp,prof} + \varepsilon_t \quad (12)$$

Hence, we explain the news coverage of different media sources with aggregate inflation π_t, the mean inflation expectations of all households $\pi_t^{exp,hh}$, and the mean price projection of professional forecasters $\pi_t^{exp,hh}$. While it stands to reason that news media relate their coverage to actual inflation and to the best available forecasts, it might be less obvious why this should also be the case for households' expectations. However, Mullainathan and Shleifer (2005) and Gentzkow and Shapiro (2010) have illustrated that consumer preferences are an important driver of newspaper coverage.

We estimate the resulting system of equations via Three-Stage-Least-Squares (3SLS). Allowing for endogeneity of news coverage, we expect the error terms of the equations explaining the expectation differentials to be correlated with the news variables. Furthermore, this endogeneity is also a potential source of correlation of the error terms across the different equations of the system, albeit not the only one. If inflation expectations are affected in a similar way by common shocks such as monetary policy decisions, this will also violate the assumption of independent errors across equations. In the latter case, we could use seemingly unrelated regressions (SUR) to account for this problem, but SUR will not give us consistent estimates if some of the explanatory variables are endogenous. We thus present estimates using system 3SLS, also discussing the differences compared to an equation-by-equation SUR approach. For the implementation of 3SLS, all variables

other than the endogenous variables of our system are taken as instruments. Using these instruments, in a first stage, the predicted variables of the dependent variables are estimated, which are then used in a second step to consistently estimate the error terms of the different equations in the system. Finally, the estimated covariance matrix is used together with the predicted values of the right-hand-side endogenous variables computed in the first stage, to estimate the structural equations (7) - (12) of the system. For the estimation of the news equations (12), we allow for up to six lags of the media variables in order to account for the persistence of news coverage, and choose those lag length which yields the best overall fit. Overall, the results do not depend on the exact number of lags. In what follows, for sake of brevity, we do not report the results of the media equations. These are available upon request.

5 Results

We now present the results of our empirical analysis. In the following section we describe in detail the results of the 3SLS-estimation, and discuss differences with equation-by-equation SUR regressions. Furthermore, we have also tested whether the reported differences in the estimated coefficients are significantly different across household groups. While we cannot reject the hypothesis of coefficient equality in some cases, we choose to report results of unconstrained regressions throughout. Generally, our conclusions do not change if we estimate restricted regressions. Second, one could question the way we quantify the qualitative survey responses on inflation expectations. We have shown in Table (2) that households' forecast errors and expectation gaps are considerably lower if we use household-specific inflation as the reference level which makes us confident that this is the appropriate quantification variable. Still, we also repeat our empirical analysis using aggregate inflation in the quantification process. Overall, the results are fairly similar for both specifications. [14]

5.1 The Volume of News Coverage

We start with explaining the expectation gaps with the weighted number of newspaper articles and television reports, the results are summarized in Table (3).
Beginning with the inflation rates, across all household groups, we observe stronger effects from household-specific price indexes compared to the overall inflation rate. Aggregate inflation raises the expectation gap of younger households, and of manual workers and

[14] Detailed results of restricted 3SLS and SUR regressions and of models using aggregate inflation to quantify households' expectations are not shown but are available upon request.

the self-employed. By contrast, the coefficients of household-specific inflation are generally larger, and also help explain part of the observed demographic heterogeneity in expectations. Compared to middle-age households, younger and older survey participants deviate more from the best available forecast in response to an increase in their corresponding inflation rate. Moreover, we observe slightly larger coefficients the poorer the households, which helps explain the larger expectation gap of low-income households. However, group-specific inflation cannot explain the larger expectation gap of the unemployed. With regard to inflation perceptions, we do not find any impact for the different household groups. These findings support the hypothesis that households focus more on price changes of goods that they encounter in everyday life than on headline inflation. In addition, the memory of consumption decisions is more important than the perception of a general price trend.

Table 3: Results: Aggregate Volume - Endogenous News Coverage

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.12***	0.09***	0.02	-0.01	-0.01	0.07*	0.04	0.02	0.07*	0.10***	0.03
	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)	(0.03)	(0.02)	(0.04)	(0.04)	(0.04)
$News_t^{pr\ index}$	-0.65***	-0.64***	-0.36*	-0.60***	-1.94***	-1.60***	-0.93***	-0.49***	-0.65***	-0.34	-1.40***
	(0.22)	(0.20)	(0.19)	(0.19)	(0.29)	(0.26)	(0.22)	(0.16)	(0.24)	(0.23)	(0.26)
$News_t^{tv\ index}$	-0.61**	-0.45**	-0.25	0.17	0.47*	0.08	0.04	0.09	-0.42*	-0.65***	-0.05
	(0.24)	(0.21)	(0.21)	(0.21)	(0.28)	(0.25)	(0.20)	(0.15)	(0.22)	(0.21)	(0.26)
$\pi_{j,t} - \pi_t$	0.13**	0.09	0.16**	0.21***	0.24***	0.21***	0.19***	0.18***	0.29***	0.31***	0.19***
	(0.07)	(0.06)	(0.07)	(0.05)	(0.06)	(0.07)	(0.06)	(0.05)	(0.10)	(0.10)	(0.06)
$perc_{j,t} - perc_t$	-0.01	0.05	0.02	-0.10	-0.03	-0.11*	0.03	-0.03	-0.04	-0.07	-0.01
	(0.07)	(0.09)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)
cons	0.34***	0.30***	0.30***	0.31***	0.57***	0.45***	0.33***	0.21***	0.31***	0.25***	0.46***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.07)	(0.06)	(0.04)	(0.03)	(0.05)	(0.04)	(0.06)
R^2	0.233	0.252	0.265	0.368	0.233	0.209	0.275	0.327	0.279	0.260	0.285
N	130				130				130		

Note: Unconstrained 3SLS regressions using equations (5) and (10). Equation (10) is estimated using 5 lags of the dependent variables. *<0.1, **<0.05, *** p<0.01. Numbers in brackets denote standard errors. Sample 1999M1-2010M3. R^2 is calculated as correlation coefficient from actual values and predicted values from 2nd stage regression.

With respect to the news media, we generally observe that a rising number of articles or television stories *lowers* the gap between households' and professional forecasters' expectations. This is an important result, since this is the first time that the negative news effect originally put forward by Carroll (2003) has been confirmed in the literature.[15] Furthermore, we observe that the strength of the news effect differs both across households and across print media and television. In general, newspaper coverage is found to have a larger effect than television reports. Across household groups, however, aggregate print media coverage does not help explain the heterogeneity of households' expectation gaps. While we observe significantly larger coefficients for low income households, since the effect is negative, we would conclude that more newspaper articles lower the expectation gap of the poor more strongly as it is the case for rich households. The same result holds

[15]By contrast, Pfajfar and Santoro (2009, 2013) either find no news effect at all or a positive sign.

true for the unemployed. By contrast, aggregate television news do give rise to larger expectation gaps of poor, unemployed, and older households. While we do not find an effect from TV news that is significantly different from zero for households older than 44 and for the unemployed, more television reports significantly *increase* the expectation gap of households in the lowest income category without affecting the remaining quartiles.
Finally, we compare the 3SLS regressions with SUR estimates, the detailed results are found in Table (10) in the Appendix. While the general picture remains unchanged, the SUR results are different in two respects. First, and as a general feature of all regressions applying SUR to the set of equations (7) - (11), the coefficients of the news variables are much lower. Second, we do not find an impact from Television news and slightly less evidence of heterogeneity in the effects of newspaper articles.

Next, we disaggregate the news indexes but use only the number of media reports in the three most important news sources *BILD*, *Tagesschau*, and *RTL*.[16] Compared to the previous estimates, the results shown in Table (4) confirm our conclusions with regard to the impact of aggregate and group-specific inflation, as well as inflation perceptions. Overall, group-specific inflation is more important than headline inflation, the effects of household-specific inflation are heterogeneous and help to some degree explain the expectation gap of the poor, the young and the old, and perceptions are generally not significant.
Disaggregating the news media, however, yields some interesting results. First, we find opposite media effects from *Tagesschau* on the one hand, and *BILD* and *RTL* on the other hand. An increase in news coverage in the latter lowers the gap between households and professional forecasters, as we would expect: following the idea of Carroll (2003), more news reports should increase the probability that households read about the best available forecast and subsequently update their beliefs on future prices. However, more news coverage in *Tagesschau* widens the expectation gap. This seems puzzling since the *Tagesschau* is associated with reputable quality journalism, while *BILD* and *RTL* are Germany's leading tabloid and private channel often marked by sensation reporting. We think that part of this surprising result stems from the fact that public TV channels such *Tagesschau*, due to its educational mandate, reports about inflation on a rather regular and neutral basis without overemphasizing unusual price changes. We further investigate this result in the next section.

Second, we observe considerable heterogeneity of news effects across different household groups. Regarding age, we get significantly larger effects of coverage in *RTL* the younger the survey participants. This result matches a well-known pattern in German media consumption, namely that the viewers of *RTL* tend on average to be younger than those

[16]The results using the entire media data set are qualitatively similar and are available upon request.

Table 4: Results: Disaggregate Volume - Endogenous News Coverage

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.07**	0.06**	-0.00	-0.01	-0.03	0.03	0.00	-0.00	-0.00	0.02	-0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)
$News_t^{Bild}$	-0.66***	-0.72***	-0.49***	-0.65***	-1.29***	-0.97***	-0.58***	-0.25*	-0.31	-0.08	-0.95***
	(0.21)	(0.19)	(0.19)	(0.19)	(0.27)	(0.24)	(0.19)	(0.15)	(0.20)	(0.19)	(0.22)
$News_t^{Tag}$	1.06***	0.91***	0.87***	0.79***	0.97***	0.77***	0.73***	0.47***	0.98***	0.90***	1.15***
	(0.25)	(0.22)	(0.22)	(0.22)	(0.29)	(0.25)	(0.20)	(0.15)	(0.23)	(0.21)	(0.26)
$News_t^{RTL}$	-0.82***	-0.62***	-0.40**	-0.13	-0.10	-0.26	-0.23	-0.10	-0.57***	-0.77***	-0.25
	(0.19)	(0.17)	(0.16)	(0.17)	(0.23)	(0.20)	(0.16)	(0.12)	(0.17)	(0.15)	(0.19)
$\pi_{j,t} - \pi_t$	0.14**	0.08	0.13*	0.18***	0.23***	0.20***	0.19***	0.21***	0.28***	0.29***	0.20***
	(0.07)	(0.06)	(0.07)	(0.05)	(0.06)	(0.07)	(0.06)	(0.05)	(0.09)	(0.09)	(0.06)
$perc_{j,t} - perc_t$	0.03	0.06	-0.00	-0.12*	0.01	-0.08	0.04	-0.04	-0.02	-0.05	-0.01
	(0.09)	(0.10)	(0.07)	(0.06)	(0.07)	(0.05)	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)
cons	0.21***	0.19***	0.21***	0.23***	0.38***	0.29***	0.21***	0.14***	0.17***	0.13***	0.29***
	(0.06)	(0.05)	(0.05)	(0.05)	(0.07)	(0.06)	(0.05)	(0.03)	(0.05)	(0.04)	(0.06)
R^2	0.306	0.321	0.3478	0.392	0.336	0.312	0.355	0.428	0.303	0.398	0.372
N	130				130				130		

Note: Unconstrained 3SLS regressions using equations (5) and (10). Equation (10) is estimated using 5 lags of the dependent variables. *<0.1, **<0.05, *** p<0.01. Numbers in brackets denote standard errors. Sample 1999M1-2010M3. R^2 is calculated as correlation coefficient from actual values and predicted values from 2nd stage regression.

of other channels. Similarly, news coverage in *Tagesschau* has a lager effect on younger households, whereas the impact of *BILD* is rather homogeneous across age groups. Separating households according to income, while no effect is found for *RTL*, news coverage of *BILD* and *Tagesschau* affect households the more the lower their income. However, given that the *BILD* lowers the expectation gap, we should get lower expectation gaps of the poor compared to the rich, which is in contrast to what we observe in the data. This result, puzzling at first glance, could also be understood in a different way. Households with the worse expectations react more to any news about inflation than other households which are less prone to media effects in general. Finally, with regard to occupation groups, we observe that *Tagesschau* increases the expectation gap of the unemployed by more than the gaps of manual workers and self-employed. However, *BILD* strongly reduces the difference between the expectations of unemployed and professional forecasters, without affect the remaining occupation groups.

Again, applying SUR instead of system 3SLS yields slightly different results (see Table 11). Most importantly, we do not find an effect of news coverage in *Tagesschau* on young households, while by contrast, media coverage in *RTL* is estimated to be significantly negative for income groups.

Summing up, we find that the pure volume of news coverage indeed helps explain the heterogeneity of households' expectation gaps, and that summing across all media sources masks important effects. Next, we move from the volume to the tone of media reports in order to shed more light on our previous, sometimes striking results.

5.2 The Tone of News Coverage

As before, we first present results of media indexes with a positive and a negative tone, before distinguishing the effects between single media sources. The results using aggregate tone variables are shown in Table (5), and again replicate the effects of inflation and perceptions. Low-income households even deviate more strongly from experts compared to what we found before.

Table 5: Results: Aggregate Tone - Endogenous News Coverage

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.06	0.03	-0.01	-0.06*	-0.11**	-0.05	-0.02	0.01	0.02	0.03	-0.04
	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)	(0.03)	(0.02)	(0.04)	(0.03)	(0.04)
$News_t^{pos\ con}$	-0.52**	-0.67***	-0.36*	-0.20	-0.20	-0.59**	-0.23	0.17	-0.57**	-0.53**	-0.42
	(0.25)	(0.22)	(0.21)	(0.23)	(0.28)	(0.24)	(0.19)	(0.15)	(0.24)	(0.23)	(0.28)
$News_t^{neg\ con}$	-0.66	-0.70	-0.54	-1.09**	-2.27***	-1.45***	-0.98**	-0.71**	-0.58	-0.52	-1.91***
	(0.56)	(0.49)	(0.48)	(0.51)	(0.65)	(0.54)	(0.44)	(0.34)	(0.48)	(0.45)	(0.57)
$News_t^{pos\ val}$	0.81***	0.81***	0.59**	0.36	0.66*	0.85**	0.61**	0.20	0.23	0.54*	-0.10
	(0.28)	(0.26)	(0.25)	(0.25)	(0.40)	(0.34)	(0.27)	(0.20)	(0.31)	(0.29)	(0.37)
$News_t^{neg\ val}$	1.56***	1.51***	0.99*	1.27**	2.90***	2.08***	1.35***	0.92***	1.39***	1.17**	2.88***
	(0.59)	(0.52)	(0.52)	(0.54)	(0.66)	(0.55)	(0.45)	(0.35)	(0.49)	(0.46)	(0.58)
$\pi_{j,t} - \pi_t$	0.18***	0.13**	0.15**	0.22***	0.34***	0.31***	0.23***	0.20***	0.27***	0.28***	0.24***
	(0.06)	(0.06)	(0.06)	(0.05)	(0.08)	(0.08)	(0.06)	(0.05)	(0.09)	(0.09)	(0.07)
$perc_{j,t} - perc_t$	0.05	0.05	-0.04	-0.05	0.01	-0.08	0.04	-0.02	-0.05	-0.05	-0.04
	(0.08)	(0.10)	(0.06)	(0.08)	(0.09)	(0.06)	(0.05)	(0.05)	(0.07)	(0.06)	(0.06)
cons	0.27***	0.27***	0.27***	0.28***	0.40***	0.36***	0.23***	0.10**	0.29***	0.24***	0.39***
	(0.06)	(0.06)	(0.05)	(0.06)	(0.08)	(0.07)	(0.05)	(0.04)	(0.06)	(0.06)	(0.07)
R^2	0.255	0.278	0.294	0.379	0.292	0.297	0.307	0.404	0.267	0.303	0.272
N	132				132				132		

Note: Unconstrained 3SLS regressions using equations (5) and (10). Equation (10) is estimated using 3 lags of the dependent variables. *<0.1, **<0.05, *** p<0.01. Numbers in brackets denote standard errors. Sample 1999M1-2010M3. R^2 is calculated as correlation coefficient from actual values and predicted values from 2nd stage regression.

Next, moving from the volume to the tone of media reports leads to the following conclusions. First, we find that the results are surprisingly sensitive to the underlying coding of the tone of news reports. Defining the tone of an article in a very narrow sense ($News_t^{pos\ val}$ and $News_t^{con\ val}$), we get positive news effects on expectation gaps, no matter if journalists judge the inflation environment positively or negatively. By contrast, if we classify the tone in a broader sense, we get negative coefficients for both positive and negative news coverage.[17] While we do not have an obvious explanation for this result, as we will show below, disaggregating the media indexes changes this result.

As regards heterogeneity, we find larger media effects for old and young households, for low income households and for the unemployed. Looking at the SUR estimates in Table (12), we do not find media effects of positive articles and TV reports. Still, we observe that reports with a negative tone broadly defined closes the expectation gap whereas the narrow definition leads to the opposite conclusion.

[17] Lamla and Lein (2010) find that a negative tone increases the gap between professional forecasters and households in the aggregate. Their result might, *inter alia*, stem from the fact that they only apply the narrow coding of the news reports in their data set.

Finally, we turn to the effects of the single news media and show the results using the number of articles with a positive tone and with a negative judgment in *BILD*, *Tagesschau*, and *RTL* in Tables (6) and (7). Remember that we restrict ourselves to the use of the context variable since the more narrowly defined valuation concept only delivers a very small number of articles with an explicit tone.

Starting with the number of positive reports, we generally find less evidence of media effects. More positive news coverage in *BILD* lowers the expectation gap for all households, while we find a significant impact of positive news in *Tagesschau* only for the youngest households and for *RTL* only for the highest income quartile. The effect of positive coverage in *BILD* is larger for low income households and for the unemployed. Applying SUR estimates results in significantly positive coefficients for positive news coverage in *Tagesschau* for nearly all household groups. The remaining results are unchanged (see Table 13).

Table 6: Results: Disaggregate Positive Tone - Endogenous News Coverage

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.01	-0.01	-0.03	-0.04	-0.11***	-0.06*	-0.03	-0.00	-0.03	-0.01	-0.10***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.04)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
$News_t^{Bild\ con\ pos}$	-0.37*	-0.66***	-0.40**	-0.43**	-0.76***	-0.85***	-0.51***	-0.08	-0.38*	-0.21	-0.64***
	(0.21)	(0.19)	(0.18)	(0.18)	(0.25)	(0.22)	(0.17)	(0.13)	(0.20)	(0.18)	(0.23)
$News_t^{Tag\ con\ pos}$	0.47**	0.20	0.16	0.06	-0.03	-0.26	-0.10	0.09	0.08	0.11	0.17
	(0.23)	(0.20)	(0.19)	(0.20)	(0.30)	(0.26)	(0.21)	(0.15)	(0.23)	(0.22)	(0.27)
$News_t^{RTL\ con\ pos}$	-0.10	0.08	0.14	0.15	0.30	0.22	0.31	0.24*	-0.13	-0.22	0.06
	(0.26)	(0.23)	(0.22)	(0.23)	(0.28)	(0.24)	(0.19)	(0.14)	(0.24)	(0.22)	(0.29)
$\pi_{j,t} - \pi_t$	0.16**	0.10	0.14**	0.20***	0.27***	0.24***	0.21***	0.20***	0.26***	0.26***	0.24***
	(0.07)	(0.07)	(0.07)	(0.05)	(0.06)	(0.07)	(0.06)	(0.04)	(0.09)	(0.08)	(0.06)
$perc_{j,t} - perc_t$	0.16*	0.12	-0.01	-0.11	0.01	-0.10*	0.02	-0.01	-0.02	0.00	0.03
	(0.09)	(0.11)	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.04)	(0.07)	(0.06)	(0.06)
cons	0.25***	0.27***	0.28***	0.30***	0.49***	0.44***	0.30***	0.15***	0.29***	0.24***	0.39***
	(0.06)	(0.05)	(0.05)	(0.05)	(0.08)	(0.07)	(0.05)	(0.04)	(0.05)	(0.05)	(0.06)
R^2	0.302	0.217	0.274	0.368	0.228	0.156	0.228	0.416	0.318	0.396	0.276
N	129				129				129		

Note: Unconstrained 3SLS regressions using equations (5) and (10). Equation (10) is estimated using 6 lags of the dependent variables. *<0.1, **<0.05, *** p<0.01. Numbers in brackets denote standard errors. Sample 1999M1-2010M3. R^2 is calculated as correlation coefficient from actual values and predicted values from 2nd stage regression.

Turning to the effects of negative news coverage, the results in Table (7) suggest that households deviate more from experts if *BILD* and *RTL* increase the number of news reports presenting inflation as a problem. Since the effects are significantly larger for young households, the poor, and the unemployed, negative news coverage indeed makes an important contribution to explaining why households' inflation expectations differ with respect to their socioeconomic background. By contrast, more negative news coverage in *Tagesschau* lowers the gap between households and professional forecasters, while the effect is larger for the young and the old, low-income households, and not significantly different from zero for occupation groups. Assuming exogeneity of news coverage and using SUR delivers a fairly different picture. According to the results in Table (14), *BILD*

has no significant impact, *Tagesschau* affects the poor and the unemployed negatively, and negative news coverage in *RTL* seem to raise the expectation gap of low-income households.

Table 7: Results: Disaggregate Negative Tone - Endogenous News Coverage

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.06*	0.05	-0.01	-0.04	0.01	0.05	0.04	0.01	0.08**	0.10***	0.08*
	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)	(0.03)	(0.02)	(0.04)	(0.04)	(0.05)
$News_t^{Bild\ con\ neg}$	0.80*	0.82**	0.26	0.36	2.34***	1.63***	0.91**	-0.41	1.40***	0.90**	3.05***
	(0.41)	(0.37)	(0.38)	(0.37)	(0.54)	(0.48)	(0.40)	(0.35)	(0.47)	(0.46)	(0.51)
$News_t^{Tag\ con\ neg}$	-1.26***	-1.14***	-1.11***	-1.45***	-1.52***	-1.31***	-0.86***	-0.57**	-0.41	-0.05	-0.20
	(0.43)	(0.39)	(0.38)	(0.38)	(0.45)	(0.39)	(0.32)	(0.24)	(0.44)	(0.40)	(0.54)
$News_t^{RTL\ con\ neg}$	0.73**	0.58*	0.61**	0.47*	0.23	0.44	0.42	0.70***	0.32	0.34	-0.42
	(0.33)	(0.30)	(0.29)	(0.29)	(0.39)	(0.34)	(0.28)	(0.23)	(0.32)	(0.30)	(0.36)
$\pi_{j,t} - \pi_t$	0.13**	0.08	0.11	0.20***	0.22***	0.18**	0.14**	0.21***	0.30***	0.28***	0.21***
	(0.07)	(0.06)	(0.07)	(0.05)	(0.07)	(0.07)	(0.06)	(0.06)	(0.10)	(0.10)	(0.06)
$perc_{j,t} - perc_t$	0.04	0.05	-0.04	-0.13**	0.08	-0.04	0.03	-0.11**	-0.09	-0.07	0.02
	(0.07)	(0.09)	(0.07)	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)
cons	0.21***	0.18***	0.21***	0.23***	0.36***	0.27***	0.20***	0.11***	0.20***	0.16***	0.32***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.07)	(0.06)	(0.04)	(0.03)	(0.05)	(0.04)	(0.06)
R^2	0.227	0.201	0.237	0.310	0.189	0.167	0.246	0.294	0.214	0.230	0.172
N	133				133				133		

Note: Unconstrained 3SLS regressions using equations (5) and (10). Equation (10) is estimated using 2 lags of the dependent variables. *<0.1, **<0.05, *** p<0.01. Numbers in brackets denote standard errors. Sample 1999M1-2010M3. R^2 is calculated as correlation coefficient from actual values and predicted values from 2nd stage regression.

Summing up, we find a number of interesting results if we split the aggregate tone variable into the three most important single news media. Remember that we were surprised to find that news coverage in *Tagesschau* widens the gap between households' and experts' inflation expectations. Distinguishing positive from negative media reports, this result does not hold anymore. Instead, a more negative judgment of price developments in *Tagesschau* moves households closer to the best available forecast. The contrary results arise for the media effects of private TV news and tabloid newspapers: In this case, a more positive news coverage makes people to be more in line with experts, while more negative news raises the expectation gap.

Cautiously speaking, these conflicting results might be interpreted as follows. *BILD* and *RTL* might overemphasize negative price developments, even if professional forecasters do not judge the situation as badly as the media. As a result, households following these news sources deviate from experts when forming beliefs about future inflation. By contrast, if *BILD* and *RTL* exceptionally present inflation as unproblematic, households' expectations will come back to professional forecasters' beliefs. For news coverage in *Tagesschau*, a different story could be told. As we have argued before, *Tagesschau* reports on inflation in a very regular manner. Moreover, the tone of its TV reports are much more balanced compared to *BILD* and *RTL* whose coverage of inflation is mainly dominated by negative news. Thus, it is likely that a negative judgment of inflation in *Tagesschau* describes the situation in a much more adequate way which is more in line with the opinions of

professional forecasters. As a result, more negative news coverage in *Tagesschau* lowers the expectation gap of households.

In addition, our results could also be understood from a different perspective. For nearly all of the estimated models, we found larger media effects for the young, the old, the poor, and the unemployed, however, since the signs of the estimated coefficients are sometimes negative, this would suggest that the expectation gaps and forecast errors of these groups are lower than they actually are. However, it could be the case that those groups that are better in forecasting inflation - high income, middle age and employed households - are simply not as prone to change their expectations as soon as they hear about information in the media. By contrast, households that are worse in predicting prices seem to react strongly to any piece of news, and thus change their beliefs more frequently. The fact that those households with the largest expectation gap and forecast error are the same whose expectation are the most volatile in terms of the standard deviation (see Table 2), gives some evidence for this interpretation.

6 Conclusion

Recently, economic research has intensified in modeling heterogeneity and exploring the implications of heterogeneous agents in macroeconomic models (Hommes, 2006). In this paper, we have analyzed the heterogeneity of inflation expectations in Germany, and, more precisely, the dependence of inflation forecasts on the demographic characteristics of households. In line with similar studies in the literature, we have found higher inflation expectations and forecast errors of households with lower income, younger households, and unemployed individuals. Furthermore, the same household groups show the largest deviations from expert expectations. We have tested the relative explanatory power of three sources that might drive these demographic expectation differentials. While we did not find an impact of aggregate inflation and household-specific inflation perceptions, we were able to identify household-specific inflation rates and heterogeneous news media consumption as main determinants of expectation differentials. Poorer and younger households deviate much more from expert forecasts in response to a change in their group-specific inflation rates, and households in lower income categories, unemployed, and younger and older households also react more strongly to news reports. Furthermore, we have shown that it is important to distinguish between different media sources, and to take into account the tone of news reports.

Our findings suggest important implications for communication strategies of central banks. If some household groups show systematic biases in inflation expectations and forecast errors, and if these differences are related to specific newspaper consumption, "the ideal

communication strategy might then be multi-tiered" (Sims, 2009). Central bankers rarely appear on television, but if it is TV reports that systematically raise the forecasts of some household groups, this might be problematic. Furthermore, if some households rely more on their group-specific inflation rate instead of overall inflation, the credibility of the central bank might be undermined.

We think that several directions of further research seem to be worth following. Until now, possible differences in inflation expectations between creditors and borrowers have not yet been explored. This might be an important issue, due to the implications for redistribution effects and risk-taking on financial markets. A further question that we have left aside in this paper is whether the reported differences in expectations are short-run or long-run phenomena. Anderson et al. (2010) have shown that the differences become minor because households learn over time. However, an impulse is needed to make this learning mechanism work, such as participating in a survey or individually-adapted communication policies. Also, as we have mentioned above, expectation differentials in Germany are found to be minor. Since we have chosen Germany mainly because of the availability of a large media data set, it would be interesting to see whether our results hold also in other countries, where demographic differences are more pronounced. Finally, it could be worth exploring one possible interpretation of our results, namely that those households with the worse expectations seem to react to any news, whereas households with better forecast capacities appear more confident with respect to their own beliefs about future prices and thus more reluctant to change these beliefs in response to news media information.

A Appendix

A.1 Literature Overview: Demographics and Inflation Expectations

The Literature Reporting Demographic Differences in Inflation Expectations

A number of studies, often conducted by central banks, have documented a direct impact of demographic characteristics on households' inflation expectations. We briefly summarize the results and refer to Table (8) on the next page for a more detailed overview. Bryan and Venkatu (2001b) conduct telephone interviews in the U.S.-state of Ohio asking respondents for their perceived and expected inflation. They report higher inflation expectations for less educated, low-income, young and old people compared to middle-age survey participants, in addition to women, singles and nonwhites. Across all groups, differences in perceived inflation are larger compared to expected inflation. In a representative survey conducted in New Zealand, Leung (2009) reports higher forecast errors for the young, individuals with a non-European background, lower income levels, females, low-skilled workers and respondents from rural areas. As it turns out, those groups which overpredict inflation correspond to those that have a higher probability of not answering the survey, hence, aggregate survey measures might be biased. Brischetto and de Brouwer (1999) offer results for Australia and report higher expectations of low-income groups and younger individuals as well. In addition, predictions were higher for the unemployed and for people with a lower education level. Respondents' political views seem to matter as well: expectations are higher for participants who claimed to support the Labor Party and the Greens. Blanchflower and MacCoille (2009) use two different surveys for the UK, one with quantitative answers and another one with qualitative responses. In both surveys, the better educated have lower expectations, whereas expectations rise with age. However, computing forecast errors over a shorter time span, people tend to better forecast inflation if they grow older. Moreover, females, unemployed and home owners are worse in forecasting inflation. Palmqvist and Stroemberg (2004) analyze survey data for Sweden, observing higher expectations for the young and the old compared to middle-age households, females, unemployed, tenants, singles and households with children. By contrast, inflation rates fall with rising education and income, and if households live in urban areas. The most comprehensive study is offered by Souleles (2004). Using micro-level data for the U.S. from December 1978 to June 1996, he computes three different forecast errors. Two measures compare expectations with inflation perceptions of the same household six months later (using qualitative and quantitative survey responses), and one measure

compares expectations with realized inflation. For all three measures, Souleles (2004) reports larger forecast errors for the elderly, females, less educated and poor households, blacks and households with a growing number of children. Finally, Bruine de Bruin et al. (2010) conduct a representative survey in the U.S in 2007 and find higher expectations for females, older people, and singles, while better educated, poorer households, as well as whites report lower forecasts. Pfajfar and Santoro (2009) provide the only study using group-level data for households in the U.S.. In line with the evidence quoted previously, they find that inflation expectations and forecast errors are higher for females, younger households, less educated, and individuals with lower levels of education.

Table 8: Studies Documenting Demographic Effects on Inflation Expectations

Paper		Bryan and Venkatu (2001b)	Leung (2009)	Brischetto and de Brouwer (1999)	Palmqvist and Stroemberg (2004)	Souleles (2004)
Country		US (Ohio)	NZ	AU	SE	US
Survey		Cleveland Fed	Reserve Bank of NZ	Melbourne Institute	Konjunkturinstitutet	Michigan Survey
Survey Level		micro	micro	micro	micro	micro
Time Span		1998m8-2001m11	1998q3-2008q3	1995m1-1998m12	2001m11-2004m5	1978m12-1996m6
Expectations		quantitative	quantitative	quantitative	quantitative	qualitative and qualitative
Dependent Variable		expectations	forecast error	expectations	expectations	forecast errors: perceptions - expectations inflation - expectations
Groups	Age	young +, old +	-	-	young +, old +	+
	Gender	female +	female +	female +	female +	female +
	Education	-	na	-	-	-
	Income	-	-	-	-	-
	Employment	na	low skilled +	unemp +	unemployed +	na
	housing	na	na	na	rent +	na
	Region	na	city -	city -	city -	0
	Race	nonwhite +	white -	na	na	white -
	Relationship Status	single +	na	na	single +	0
	Political Tendency	na	na	Labor, Greens +	na	na
	Children in Household	na	na	na	children +	children +
Explanation		none	none	none	none	none

	Blanchflower and MacCoille (2009)			Pfajfar and Santoro (2009)	Burke and Manz (2011)	Bruine de Bruin et al. (2010)
	UK	UK	UK		US	US
	Bank of England	GfK	Eurobarometer		Harvard University	own survey
	micro	micro	micro	group-level	micro	micro
	2001q1-2009q2	1996m1-2008m10	2005-2007	expectations	2009m12	2007
	quantitative, ranges	qualitative	quant, ranges	1978m1-2005m2	quantitative	quantitative
	expectations	expectations	forecast error	expectations	forecast error	expectations
				forecast error	expectations	
Age	+	+	-	-	+ (> 32)	+
Gender	female -	female +	female +	female +	0	female+
Education	-	-	-	-	0	-
Income	na	na	na	-	0	-
Employment	0	self-employed -	unemp +	na	0	na
Housing	rent +	na	rent +	na	0	na
Region	na	city +	na	0	0	na
Race	na	na	na	na	white -	white -
Relationship Status	na	na	na	na	na	single +
Political Tendency	na	na	na	na	na	na
Children in Household	na	na	na	na	na	na
	infl perceptions: more education, less effect from perceptions satisfaction with BoE: more satisfied, lower expectations (not for age)	perceptions	none	news consumption hh-specific inflation	financial literacy	hh-specific inflation financial literacy

Note: + (-) means above (below) average inflation expectations or forecast errors. 0 denotes no significant effect, and na means that the category is not included in the survey.

The Impact of Demographics on Inflation Expectations: Explanations in the Literature

This section classifies the various determinants of inflation expectations disagreement[18] of households proposed in the literature.[19] We illustrate our proposed summary in Figure (4). In general, households' socioeconomic background can affect expectations via four channels. First, personal attributes such as individual processing capacities vary between households, resulting in different expectations. Second, households might hold different beliefs on future prices because they find themselves in different microeconomic situations. Third, individuals might react differently to the macroeconomic environment. Fourth, different news media report differently on inflation, and since households consume different newspapers and TV shows, this results in heterogeneous inflation expectations. Note that the media effect works both directly (e.g., because old people spend more time readings newspapers than the young) and indirectly (if households with large asset holdings read newspapers specialized on economic issues, for example). We will briefly explain each of these channels, and present the results of studies that have made use of these channels in order to explain demographic differences in inflation expectations.

The Influence of Personal Attributes To put it simple: inflation expectations are different because individuals are different. They use different information sets, spend a different amount of time to interpret incoming news, have different capacities of processing information, and use more or less sophisticated models of expectation formation. As it is shown in a number of recent papers, each of these personal attributes result in disagreement in individuals' inflation expectations. The sticky information model of Mankiw and Reis (2002a, 2007) assumes that acquiring information is costly, leading to the result that only a fraction of individuals makes use of all the information available while the remaining fraction sticks to information sets collected in the past. Relying on the assumption that information processing capacities are limited, Sims (2003) shows that some individuals will rationally choose not to updated to the latest available information sets, while Branch (2004) argues that individuals might even switch between different expectation formation models. Likewise, in the context of learning models (Evans and Honkapohja, 2001), people will more or less quickly converge to the rational expectations benchmark, if their learning curves are different. And Capistran and Timmermann (2009) argue that households have heterogeneous and asymmetric loss functions, thereby weighting the costs of over- and underpredicting inflation differently.

[18] In what follows, we use the terms " disagreement" and "heterogeneity" interchangeably.

[19] The disagreement of professional forecasters raises additional questions, since factors such as herding behavior are found to play an important role (Gallo, Granger, and Jeon, 2002).

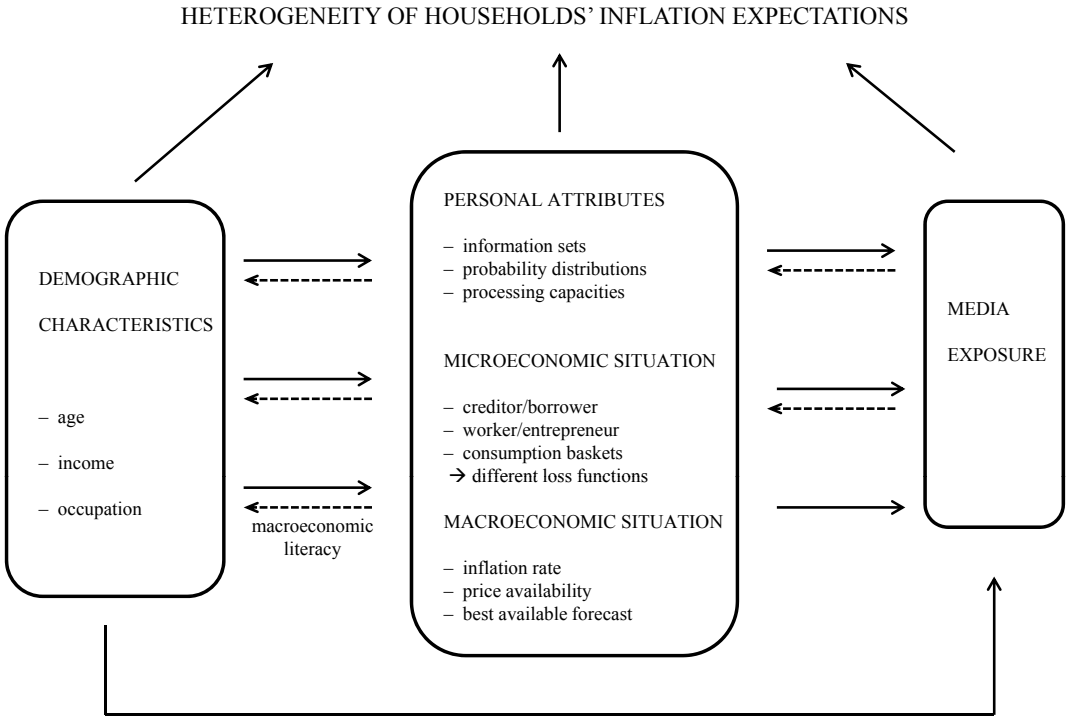


Figure 4: Driving Forces of Households' Disagreement on Inflation Expectations

Each of these models makes a microeconomic assumption on individuals' personal attributes and analyze the implied impact on the heterogeneity of inflation expectations on the macroeconomic level. The assumptions on information acquisition and processing can be related to specific household characteristics thus explaining the effect from demographics on inflation expectations. For example, older households might have more experience in understanding the concept of inflation resulting in faster updating and learning pattern. However, it might also be the case that younger households are better in adjusting to new information technologies and policy regimes resulting in more rational expectations of households in younger age. Similarly, unemployed individuals might be less familiar with every-day economic decision making compared to employees or self-employed individuals who are used to do their own book-keeping. Finally, with regard to education, individuals with a high-school degree are expected to better understand the determinants of inflation thus leading to better inflation forecasts if households reach higher education levels.
These possible links between models of information formation and heterogeneous inflation expectations arising from households' socioeconomic backgrounds are rarely tested, though. In two cross-section studies, Burke and Manz (2011) and Bruine de Bruin et al. (2010) argue that the demographic differences of inflation expectations can be explained

by households' degree of financial literacy (Lusardi and Mitchell, 2008). They show that individuals' demographic characteristics determine the financial literacy score of individuals which turns out to significantly improve households' inflation forecasts. However, both papers suffer from the fact that they do not find large effects from demographics in the first place, which might be due to the small cross-section dimension.[20] Hence, only some demographic effects can be explained by financial literacy: Burke and Manz (2011) can account for the impact of race (the higher expectations of black survey respondents), while Bruine de Bruin et al. (2010) find lower point estimates for all demographic variables if financial literacy is included, however, the demographic effects are already found to be insignificant without financial literacy. A third paper shows that demographic differences between individuals' expectations are reduced by learning (Anderson et al., 2010). Exploiting the short panel dimension of the Michigan survey[21], those groups that show the largest forecast error in the first interview (low income, female, non-white, young, households with children) show larger reductions of their expectation errors than other groups. Hence, even if Anderson et al. (2010) cannot explain why households' expectations differ in the first place, their results suggest that heterogeneity can be reduced by appropriate communication policies of the central bank or increased news coverage.

The Role of Households' Microeconomic Situation Apart from psychological reasons or different personal attributes, the expectation formation models quoted above can also be linked to the microeconomic situation of households. For example, indebted households might consider inflation as a gain whereas individuals with large asset holdings are expected to spend more time and effort to forecast expectations in order to protect the real value of their wealth. Here, the argument is that households will rationally weight costs and benefits of making a good forecast, and that the cost-benefit analysis depends on their socioeconomic background. Following this reasoning, conflicting conclusions might arise. Whereas old agents are expected to make better forecasts due to higher asset holdings, they could also provide less accurate forecasts since they face higher opportunity costs due to a shorter remaining lifetime (Fishe and Idson, 1990). Empirically, the hypothesis that the dependence of inflation expectations on demographic characteristics stems from households' microeconomic situation is tested by using household-specific inflation rates and inflation perceptions.

The overall Consumer Price Index (CPI) is calculated for consumption goods of a representative individual. Hence, if some households consistently consume more or less of the goods that are included in the CPI, their group-specific inflation rate will differ from

[20] For example, the highest age category used by Burke and Manz (2011) is "older than 32".
[21] 40% of respondents are interviewed a second time six months after the first interview.

overall inflation.[22] A number of papers has documented households' inflation differentials arguing that these can be related to individuals' socioeconomic background. Overall, households with low income, low education levels and older households face higher inflation rates. Results for the U.S. are provided by Michael (1979), Hagemann (1982), Hobijn and Lagakos (2005), and McGranahan and Paulson (2006), while Colavecchio et al. (2011) offer results for a panel of 15 European countries. We refer to the latter study for a comprehensive literature review. For Germany, there exists only one unpublished study quoted by Colavecchio et al. (2011), suggesting higher inflation rates for the elderly and for households with high income levels.

Jonung (1981) was among the first to suggest that the differences in group-specific inflation rats can account for the differences in inflation expectations, especially the higher inflation expectations of women compared to men. Since women were thought to be mainly responsible for food purchases, and since food prices were rising faster than CPI at the time of his survey, females reported higher inflation expectations. However, Bryan and Venkatu (2001a) could not support this hypothesis, leaving the gender inflation differential an open research question. More generally, Pfajfar and Santoro (2009) provide some support for the view that households are better in forecasting their group-specific inflation rate instead of CPI inflation. They find that for low and middle income households, the forecast error is smaller if household-specific inflation is used, while richer households are better in forecasting overall inflation. However, separating households with respect to education always yields lower forecast errors for aggregate inflation, while the results are mixed for the elderly. Bruine de Bruin et al. (2010) ask participants in a survey conducted at the end of 2007 about their thoughts when forming their inflation expectations. Including the responses "thoughts about prices you pay" and "thoughts about how to cover expenses" makes the initial effect from education insignificant. This suggests that individuals with lower education levels think more of their group-specific inflation rate instead of overall CPI inflation. Anderson, Becker, and Osborn (2012) proxy household-specific inflation rates with inflation rates at the top-level item categories in the U.S.-CPI. They argue that poor households spend a larger fraction of their overall expenditure on housing, thus above average price changes in this category should impact more on households with lower income levels. However, splitting the CPI into its components does not help explain that some households report higher expectations than others.[23]

Apart from different cost-benefit-analysis arising from the household's microeconomic situation, households' dependence on individual inflation rates can also be explained by

[22] Indeed, Inoue, Kilian, and Burcu Kiraz (2009) show that inflation expectations derived form households' spending pattern outperform survey measures in forecasting CPI inflation.

[23] This might stem from the fact that the CPI categories are not precise enough in measuring household-specific consumption spending.

psychological effects. According to the availability hypothesis (Tversky and Kahneman, 1973), people have a better memory for prices of goods they buy more frequently. Hence, if survey participants are asked for their price expectations, they might implicitly use a goods basket as reference point that relates more to their individual consumption. It is by no means clear, however, that consumers indeed rely on household-specific inflation rates. Research in psychology summarized by Ranyard et al. (2008) shows that households have difficulties in recalling prices they have paid, even of goods they bought recently. If this is true, households would not base their expectations on actual group-specific inflation rates, but instead use an estimate of past prices, the so-called perceived inflation rate. Since the ability of retrospection might be systematically related to households' demographic characteristics, households with lower income levels might perceive their own inflation rate much stronger than other households, which subsequently feeds into larger expectation differentials.

Blanchflower and MacCoille (2009) provide the only study that tests the impact of inflation perceptions on households' expectations. However, demographic differences in inflation expectations still prevail if perceived inflation is included as explanatory variable. Only with respect to education, their results suggest that more educated individuals tend to rely less on perceptions when forecasting inflation.

The Macroeconomic Environment In the near-rationality model of Akerlof et al. (1996, 2000), the heterogeneity of inflation expectations depends on the level of the overall inflation rate. In a low-inflation environment, most agents tend to ignore latest news on inflation, while as soon as inflation picks up, a growing number of individuals starts forming expectations rationally until inflation reaches a level where again, all households share the same beliefs on future prices. Mankiw et al. (2003) test the impact of the macroeconomic environment on expectation disagreement, using the level and the change of overall inflation, relative price variability and the output gap as explanatory variables. Gnan et al. (2011), using group level data for a panel of 12 Euro Area countries, repeat their analysis and test whether the within-group forecast disagreement is different between demographic groups. Across all groups, a positive output gap and rising inflation lowers the disagreement of households in the same group, while an increase in relative price variability leads to more disagreement. With regard to differences between household groups, their results suggest that the richer the households the more they tend to agree on expectations if inflation rises. The same holds true for young and old households, households with higher education and males, while no clear pattern emerges for the price variability and the output-gap. However, since the authors do not report how the within-group disagreement varies between groups, it remains unanswered whether

the demographic differences in households' inflation expectations can be explained with different reactions to macroeconomic conditions. Instead of referring to real economic data, Blanchflower and MacCoille (2009) claim that it is households' trust in the policy of the central bank that leads to different expectations between household groups. Generally, they find that individuals who are more satisfied with the conduct of monetary policy report lower inflation expectations compared to dissatisfied households. Only for age groups, they observe higher expectations for the elderly even if these have greater confidence in the central bank. Instead of trusting in the central bank, households might rely on the expectations of professional forecasters serving as a proxy for the best available forecast in an economy. Carroll (2003) has proposed that on aggregate, households only sluggishly update their expectations in line with those of professional forecasters. Pfajfar and Santoro (2009) apply this framework to households' inflation expectations differentiated by demographic characteristics. They find that males as well as younger and older households rely more on expert forecasts than others. Also, households in the lowest income and lowest education group react least to the best available forecast. However, the results that rising income and education leads to lower inflation expectations and forecast errors cannot be explained by increased attention to expert forecasts. Finally, Malmendier and Nagel (2012) test whether households rely on inflation experiences in their lifetimes when forming their expectations. Younger households should be affected more by recent price developments than older households whose information sets reach back further in the past. Hence, individuals who have experienced the high-inflation period in the 1970s should be slower in adjusting their expectations to the following low-inflation period. Their empirical analysis indeed supports this view of "learning by experience".

Household-Specific Media Exposure Pfajfar and Santoro (2009) investigate the role of the news media for explaining the dependence of inflation expectations on demographic characteristics. They do not use a media measure for news coverage such as the number of articles in a given newspaper, but employ the answers to a question included in the Michigan Survey. Households are asked whether they have heard (favorable and unfavorable) news about prices within the past months. It turns out that the better educated and the richer the households, the higher the fraction of respondents who have heard news about prices. The same holds true for men, while with regard to age, middle-age households report to be better informed than others. Hence, with the exception of age, it seems that the higher forecast errors of some household groups stem from the fact that they do not pay enough attention to news. In a second step, Pfajfar and Santoro (2009) test whether the fact that households have heard news about inflation affects the distance of their expectations from professional forecasters' expectations, as suggested by Carroll (2003).

For example, if a piece of news has a larger impact on this expectation gap for low income households compared to high income households, one could attribute the demographic differences in expectations to different news reception. Generally, however, their results do not support this hypothesis. With regard to the overall number of news heard, they find larger news effects for the young, the better educated, males, and the rich, but since the media effect is always found to be positive, this means that these households deviate more from the expert forecast if they receive news on inflation.[24] Distinguishing favorable news from unfavorable news, the same picture emerges. While more positive news make households to be more in line with experts, the effect is stronger for the less educated and poorer households. Conversely, more negative news increase the expectation gap more strongly for better educated and richer households. The same pattern holds true for gender. Anderson et al. (2012) also exploit the "news heard"-question from the Michigan survey, but add news heard about government spending, employment, and money and profits to news about inflation. Part of their results support the hypothesis that news drive expectation differentials. Females more than proportionally increase their inflation expectations if they hear positive news on government spending, while the effect from news about inflation does not differ between sexes. Similarly, the least educated households raise their expectations in response to positive news on fiscal spending, and in response to negative news on inflation. A slightly stronger news effect is observed for young and old households compared to middle-aged individuals, while the results are less supportive for income groups: news on inflation do not have a heterogeneous effect, only positive news about employment increase the expectations of low income households relative to households with higher income. Finally, Lamla and Maag (2012) find that more negative news reports on inflation reduces the within-group disagreement of German households. Differentiating households only with respect to education, the media effect rises with the education level of households.

A.2 Quantification Technique

This section describes the probability method used to to quantify the qualitative survey responses, where we follow Nielsen (2003) who applies the method to the Consumer Survey of the European Commission. Remember that survey participants have six possible answer

[24] Pfajfar and Santoro (2009) do not say whether those groups with higher forecast errors correspond to those with the largest deviation from professional forecasters' expectations. Implicitly, they seem to assume that this is the case.

categories to the question on how they think consumer prices will develop in the future:

pp : "rise a lot"
p : "rise moderately"
e : "rise slightly"
m : "stay about the same"
mm : "fall"
dn : "don't know"

Thus, for each month, the survey provides the fractions of respondents choosing one of the above answer categories. In a first step, we proportionally add the fraction of "don't know"-answers to the remaining five categories, such that

$$ffrac_i = frac_i + frac_i/5, \text{ where } frac_i \in \{mm, m, e, p, pp\} \tag{13}$$

Next, using the notation of Nielsen (2003), we assume an interval $(-\delta_t^L, \delta_t^U)$ around 0, which defines those inflation rates that individuals associate with stable prices. Similarly, we assume an interval $(\tilde{\mu}_t - \varepsilon_t^L, \tilde{\mu}_t + \varepsilon_t^U)$ which captures inflation rates that are associated with prices thought to "increase at the same rate". Applying these assumptions to the reaming answer categories, we get

prices will...

$$\begin{array}{lll} \text{fall slightly} & \text{if} & \pi_{t+1}^e \leq -\delta_t^L \\ \text{be stable} & \text{if} & -\delta_t^L < \pi_{t+1}^e \leq \delta_t^U \\ \text{increase at slower rate} & \text{if} & \delta_t^U < \pi_{t+1}^e \leq \tilde{\mu}_t - \varepsilon_t^L \\ \text{increase at same rate} & \text{if} & \tilde{\mu}_t - \varepsilon_t^L < \pi_{t+1}^e < \tilde{\mu}_t + \varepsilon_t^U \\ \text{increase more rapidly} & \text{if} & \tilde{\mu}_t + \varepsilon_t^U \leq \pi_{t+1}^e \end{array} \tag{14}$$

Next, we use the fractions of the answer categories fmm, fm, fe, fp, fpp, and express the intervals in terms of the cumulative standard normal distribution function ϕ:

$$qmm_{t,t+1} = \phi^{-t}(fmm_{t,t+1}) \tag{15}$$

$$qm_{t,t+1} = \phi^{-t}(fmm_{t,t+1} + fm_{t,t+1}) \tag{16}$$

$$qe_{t,t+1} = \phi^{-t}(fmm_{t,t+1} + fm_{t,t+1} + fe_{t,t+1}) \tag{17}$$

$$ep_{t,t+1} = \phi^{-t}(fmm_{t,t+1} + fm_{t,t+1} + fe_{t,t+1} + fp_{t,t+1}) \tag{18}$$

Finally, Nielsen (2003) shows that the quantified mean inflation expectation is given by

$$\mu_{t,t+1} = \frac{\tilde{\mu}_t(qmm_{t,t+1} + qm_{t,t+1})}{q_{t,t+1}} \tag{19}$$

where $q_{t,t+1}$ is defined as $q_{t,t+1} = qmm_{t,t+1} + qm_{t,t+1} - qe_{t,t+1} - qp_{t,t+1}$. Hence, the only unknown parameter in the equation of households' quantitative inflation expectations is the perceived inflation rate $\tilde{\mu}_t$. We replace $\tilde{\mu}_t$ with the HP-filter of households' group-specific inflation rate, whereas the filter is calculated recursively over 20 months. Using different lag lengths does not qualitatively change the results for the quantified rate of inflation expectations.

A.3 Additional Tables and Figures

Table 9: Data Sources

Data	Start Date	End Date	Source	Link
Households' Expectations and Perceptions	1998M09	2010M05	European Commission (EC)	EC
Household-specific Inflation	1997M01	2010M06	EC Household Budged Surveys (HBS)	HBS
Professional Forecasters' Expectations	1989M10	2010M03	Consensus Economics	Consensus
Inflation Rates (HICP)	1997M01	2012M03	Eurostat	Eurostat
Media Coverage	1998M01	2011M02	Media Tenor	Media Tenor
Media Circulation (TV)	1998Q1	2011Q4	Media Perspektiven (MP)	MP
Media Circulation (Print)	1998Q1	2011Q4	Informationsgemeinschaft zur Feststellung der Verbreitung von Werbeträgern e.V. (IVW)	IVW

Figure 5: Inflation Expectations of Households

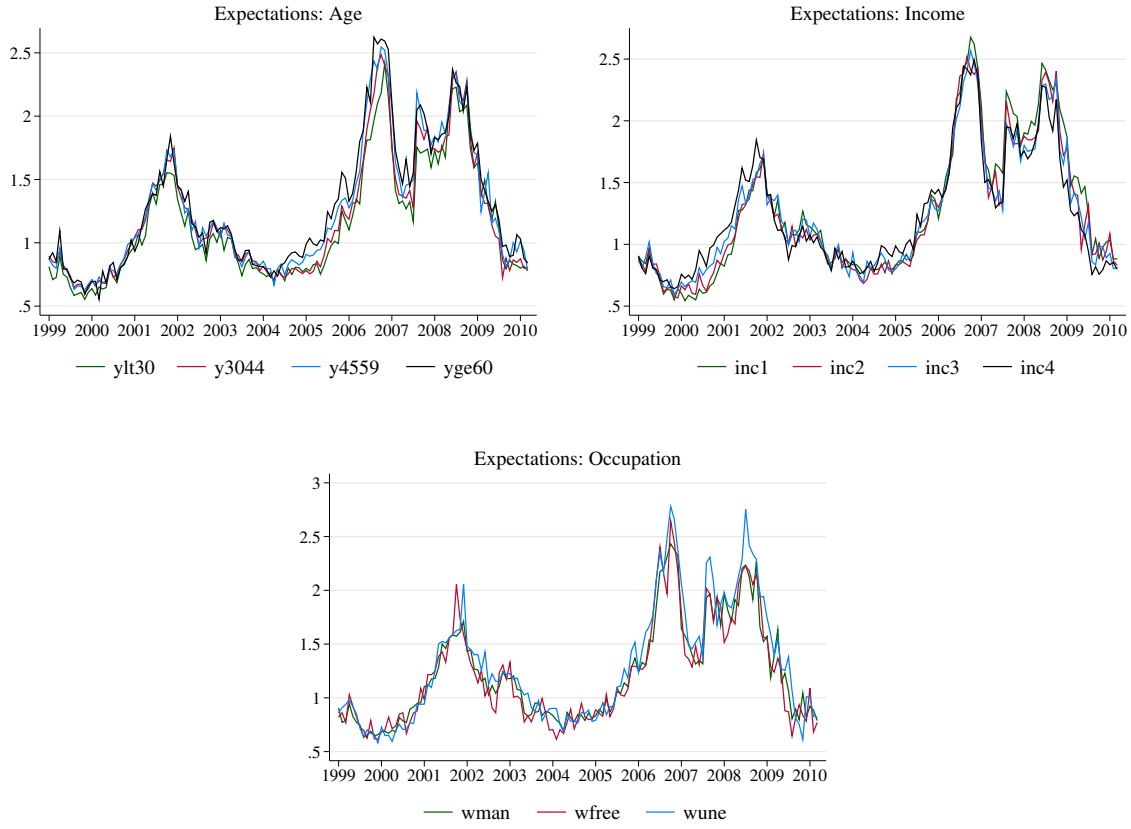


Figure 6: Print Run and TV Audience

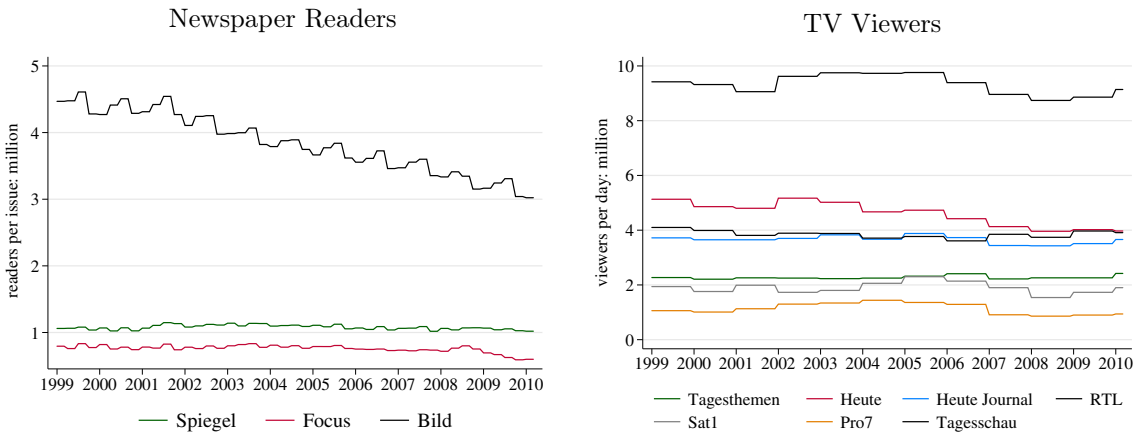


Figure 7: Media Coverage Ia: Number of News Reports About Inflation per Month

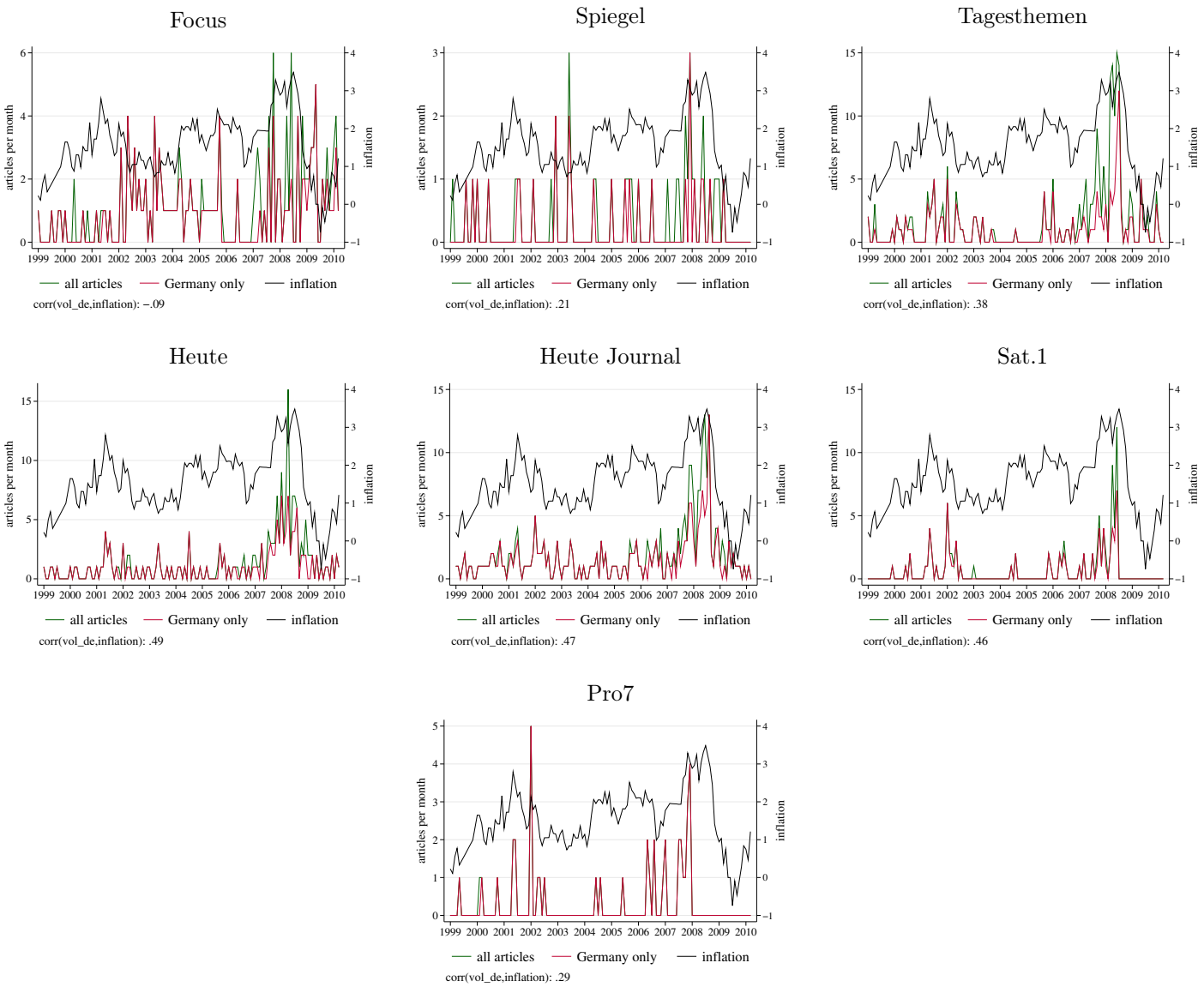


Figure 8: Media Coverage IIa: Number of Positive and Negative News About Inflation per Month - Context

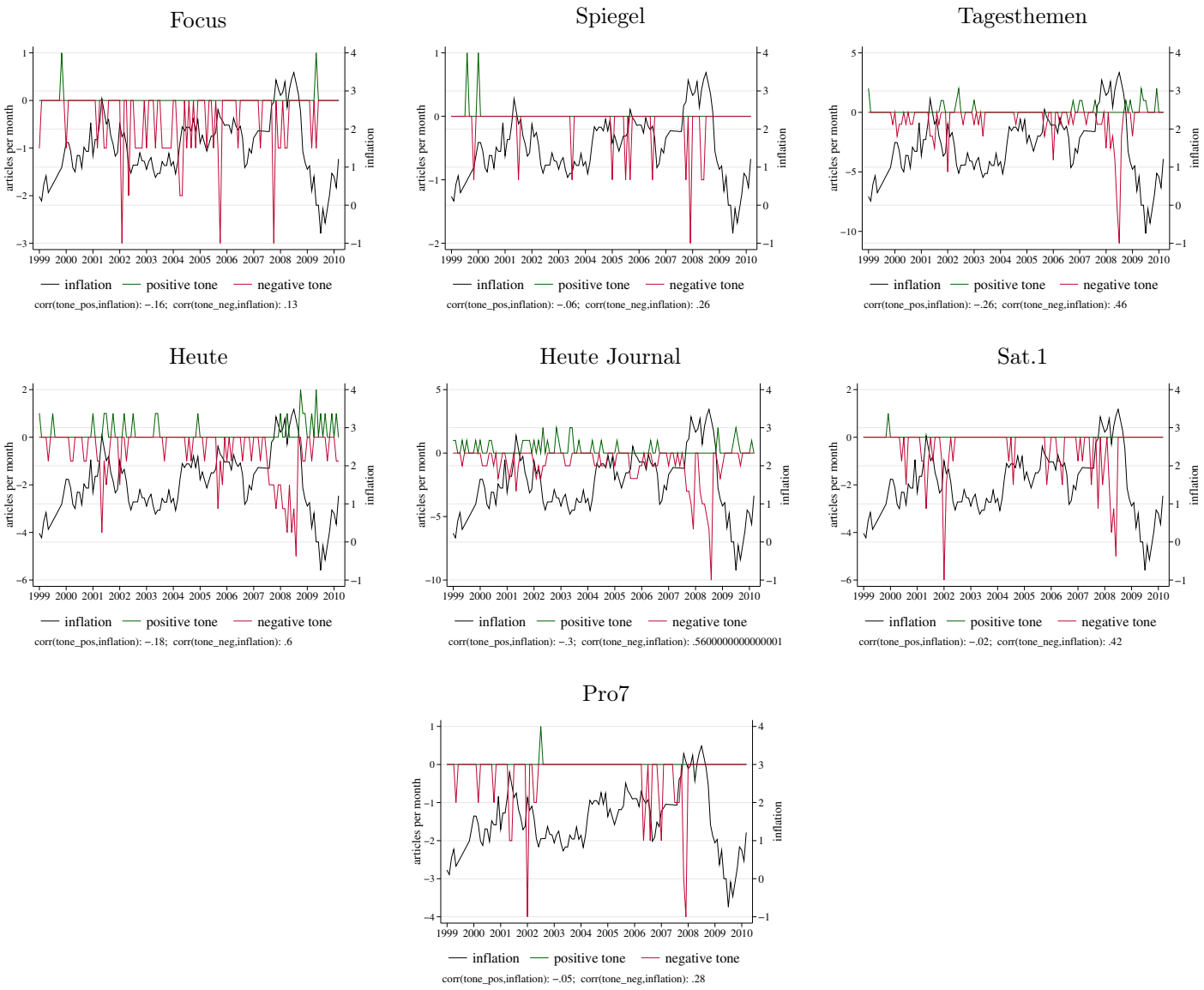
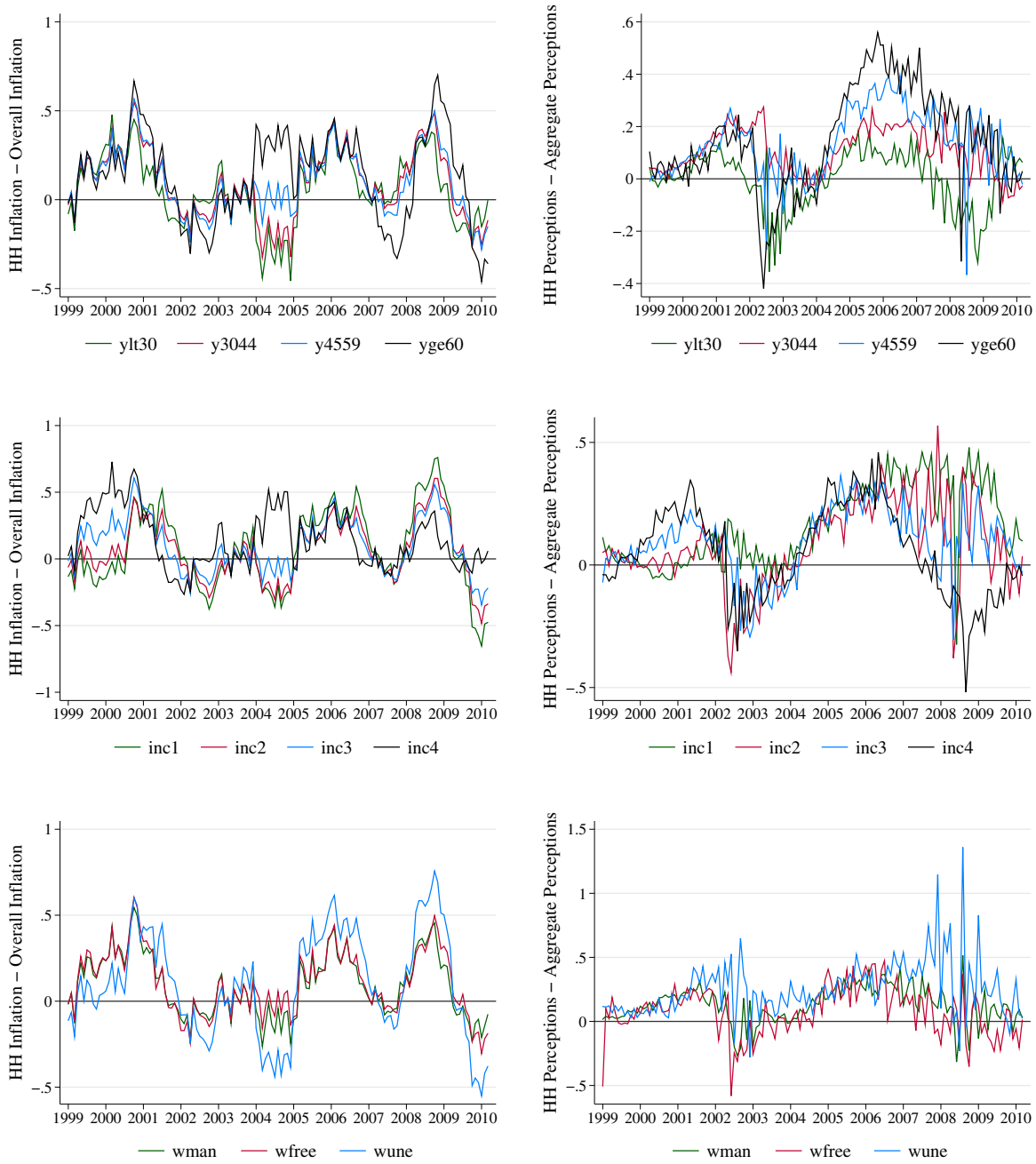


Figure 9: Differentials of HH-Inflation and HH-Perceptions



A.4 Results Assuming Exogeneity of Media Variables

Table 10: Results: Aggregate Volume of Media Reports - SUR Regression

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.05	0.04	-0.00	-0.02	-0.06	0.00	0.01	0.01	0.01	0.02	-0.06*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)
$News_t^{pr\ index}$	-0.23*	-0.25**	-0.21*	-0.20*	-0.33**	-0.25*	-0.21*	-0.10	-0.18	-0.12	-0.33**
	(0.13)	(0.12)	(0.12)	(0.12)	(0.17)	(0.15)	(0.12)	(0.09)	(0.12)	(0.12)	(0.14)
$News_t^{tv\ index}$	-0.13	-0.11	0.01	0.07	0.06	-0.07	-0.04	-0.01	-0.07	-0.03	0.09
	(0.14)	(0.12)	(0.12)	(0.12)	(0.17)	(0.15)	(0.12)	(0.09)	(0.12)	(0.12)	(0.14)
$\pi_{j,t} - \pi_t$	0.13*	0.07	0.12*	0.20***	0.24***	0.18***	0.16***	0.16***	0.27***	0.28***	0.23***
	(0.07)	(0.06)	(0.06)	(0.05)	(0.06)	(0.07)	(0.05)	(0.04)	(0.08)	(0.08)	(0.06)
$perc_{j,t} - perc_t$	0.06	0.04	-0.02	-0.10*	0.03	-0.08	0.01	-0.05	-0.03	-0.04	0.01
	(0.08)	(0.09)	(0.06)	(0.06)	(0.07)	(0.05)	(0.06)	(0.04)	(0.06)	(0.05)	(0.05)
cons	0.27***	0.23***	0.25***	0.25***	0.40***	0.31***	0.24***	0.16***	0.24***	0.20***	0.34***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
R^2	0.082	0.080	0.090	0.188	0.080	0.083	0.122	0.159	0.118	0.144	0.110
N	134				134				134		

Note: Unconstrained SUR regressions. *<0.1, **<0.05, *** p<0.01. Sample 1999M1-2010M3. S.e.'s in brackets.

Table 11: Results: Disaggregate Volume of Media Reports

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.05*	0.04	0.00	-0.01	-0.05	0.00	0.01	0.02	0.01	0.03	-0.06*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)
$News_t^{Bild}$	-0.24*	-0.24**	-0.23**	-0.21*	-0.36**	-0.25*	-0.22*	-0.09	-0.21*	-0.12	-0.35***
	(0.13)	(0.12)	(0.11)	(0.11)	(0.16)	(0.14)	(0.11)	(0.08)	(0.12)	(0.11)	(0.13)
$News_t^{Tag}$	0.21	0.21*	0.29***	0.30***	0.44***	0.31**	0.23**	0.21**	0.17	0.29***	0.37***
	(0.13)	(0.12)	(0.11)	(0.11)	(0.17)	(0.15)	(0.12)	(0.08)	(0.12)	(0.11)	(0.14)
$News_t^{RTL}$	-0.25**	-0.23**	-0.18*	-0.13	-0.20	-0.23*	-0.18*	-0.16**	-0.16	-0.26***	-0.09
	(0.11)	(0.10)	(0.10)	(0.10)	(0.14)	(0.12)	(0.10)	(0.07)	(0.10)	(0.09)	(0.12)
$\pi_{j,t} - \pi_t$	0.11*	0.06	0.10	0.19***	0.23***	0.17***	0.15***	0.16***	0.24***	0.25***	0.22***
	(0.06)	(0.06)	(0.06)	(0.05)	(0.06)	(0.06)	(0.05)	(0.04)	(0.08)	(0.08)	(0.06)
$perc_{j,t} - perc_t$	0.06	0.05	-0.02	-0.10	0.04	-0.07	0.01	-0.06	-0.04	-0.03	0.03
	(0.08)	(0.09)	(0.06)	(0.06)	(0.07)	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)	(0.05)
cons	0.23***	0.20***	0.22***	0.22***	0.34***	0.26***	0.21***	0.14***	0.21***	0.16***	0.29***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
R^2	0.128	0.125	0.141	0.222	0.137	0.130	0.163	0.205	0.147	0.213	0.158
N	134				134				134		

Note: Unconstrained SUR regressions. *<0.1, **<0.05, *** p<0.01. Sample 1999M1-2010M3. S.e.'s in brackets.

Table 12: Results: Aggregate Tone of Media Reports

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.02	0.01	-0.03	-0.04	-0.10**	-0.03	-0.02	0.01	-0.02	0.01	-0.08**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)
$News_t^{pos\ con}$	-0.12	-0.15	-0.08	-0.06	-0.10	-0.19	-0.09	-0.00	-0.14	-0.07	-0.08
	(0.13)	(0.11)	(0.11)	(0.11)	(0.16)	(0.14)	(0.11)	(0.08)	(0.12)	(0.11)	(0.14)
$News_t^{neg\ con}$	-0.31	-0.34	-0.48**	-0.51**	-0.76**	-0.49*	-0.37*	-0.30*	-0.27	-0.26	-0.57**
	(0.25)	(0.22)	(0.21)	(0.21)	(0.31)	(0.27)	(0.22)	(0.16)	(0.22)	(0.21)	(0.26)
$News_t^{pos\ val}$	0.15	0.15	0.15	0.07	0.17	0.21	0.11	0.12	0.11	0.18*	0.14
	(0.13)	(0.11)	(0.11)	(0.11)	(0.16)	(0.14)	(0.11)	(0.08)	(0.11)	(0.10)	(0.13)
$News_t^{neg\ val}$	0.51**	0.52**	0.57***	0.51**	0.84***	0.62**	0.47**	0.38***	0.39*	0.36*	0.68***
	(0.24)	(0.21)	(0.20)	(0.20)	(0.30)	(0.26)	(0.21)	(0.15)	(0.21)	(0.20)	(0.25)
$\pi_{j,t} - \pi_t$	0.15**	0.10	0.13**	0.21***	0.25***	0.20***	0.17***	0.15***	0.27***	0.28***	0.24***
	(0.06)	(0.06)	(0.06)	(0.05)	(0.06)	(0.07)	(0.05)	(0.04)	(0.08)	(0.08)	(0.06)
$perc_{j,t} - perc_t$	0.07	0.05	-0.01	-0.10	0.02	-0.08	0.02	-0.05	-0.03	-0.03	0.01
	(0.08)	(0.09)	(0.06)	(0.06)	(0.07)	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)	(0.05)
cons	0.25***	0.22***	0.24***	0.25***	0.39***	0.31***	0.23***	0.14***	0.24***	0.19***	0.33***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
R^2	0.102	0.110	0.135	0.215	0.117	0.124	0.145	0.189	0.134	0.175	0.131
N	134				134				134		

Note: Unconstrained SUR regressions. *<0.1, **<0.05, *** p<0.01. Sample 1999M1-2010M3. S.e.'s in brackets.

Table 13: Results: Disaggregate Positive Tone of Media Reports

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.02	0.01	-0.01	-0.02	-0.08**	-0.02	-0.01	0.01	-0.01	0.01	-0.07**
	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
$News_t^{Bild\ con\ pos}$	-0.21*	-0.17*	-0.17*	-0.16*	-0.28**	-0.22*	-0.17*	-0.04	-0.18*	-0.10	-0.18
	(0.11)	(0.10)	(0.09)	(0.09)	(0.14)	(0.12)	(0.10)	(0.07)	(0.10)	(0.09)	(0.12)
$News_t^{Tag\ con\ pos}$	0.23**	0.19*	0.21**	0.16	0.29**	0.22*	0.17*	0.19***	0.17*	0.29***	0.25**
	(0.11)	(0.10)	(0.10)	(0.10)	(0.14)	(0.13)	(0.10)	(0.07)	(0.10)	(0.09)	(0.12)
$News_t^{RTL\ con\ pos}$	-0.04	-0.11	-0.07	-0.09	-0.10	-0.06	-0.05	-0.02	-0.06	-0.13	-0.08
	(0.14)	(0.13)	(0.12)	(0.12)	(0.18)	(0.16)	(0.12)	(0.09)	(0.12)	(0.11)	(0.15)
$\pi_{j,t} - \pi_t$	0.11*	0.06	0.09	0.18***	0.24***	0.18***	0.17***	0.17***	0.23***	0.22***	0.22***
	(0.07)	(0.06)	(0.06)	(0.05)	(0.06)	(0.07)	(0.05)	(0.03)	(0.08)	(0.08)	(0.06)
$perc_{j,t} - perc_t$	0.09	0.07	-0.03	-0.13**	0.04	-0.07	0.02	-0.04	-0.02	0.01	0.02
	(0.08)	(0.10)	(0.06)	(0.06)	(0.07)	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)	(0.06)
cons	0.24***	0.20***	0.23***	0.24***	0.36***	0.28***	0.22***	0.13***	0.22***	0.17***	0.30***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
R^2	0.095	0.083	0.100	0.190	0.104	0.098	0.140	0.201	0.129	0.194	0.115
N	134				134				134		

Note: Unconstrained SUR regressions. *<0.1, **<0.05, *** p<0.01. Sample 1999M1-2010M3. S.e.'s in brackets.

Table 14: Results: Disaggregate Negative Tone of Media Reports

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.03	0.02	-0.01	-0.02	-0.08**	-0.02	-0.00	0.02	-0.00	0.01	-0.07**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)
$News_t^{Bild\ con\ neg}$	0.12	0.10	0.05	-0.01	0.05	-0.01	0.09	0.01	0.09	-0.02	0.14
	(0.17)	(0.15)	(0.14)	(0.14)	(0.21)	(0.18)	(0.15)	(0.11)	(0.15)	(0.14)	(0.17)
$News_t^{Tag\ con\ neg}$	-0.20	-0.18	-0.25*	-0.32**	-0.44**	-0.29	-0.21	-0.11	-0.10	-0.19	-0.30*
	(0.17)	(0.15)	(0.14)	(0.14)	(0.21)	(0.19)	(0.15)	(0.11)	(0.15)	(0.14)	(0.18)
$News_t^{RTL\ con\ neg}$	0.25	0.20	0.23*	0.22*	0.34*	0.30*	0.19	0.17*	0.14	0.22*	0.18
	(0.16)	(0.14)	(0.13)	(0.13)	(0.20)	(0.17)	(0.14)	(0.10)	(0.14)	(0.13)	(0.16)
$\pi_{j,t} - \pi_t$	0.13**	0.08	0.12**	0.21***	0.24***	0.18***	0.16***	0.15***	0.27***	0.28***	0.24***
	(0.06)	(0.06)	(0.06)	(0.05)	(0.06)	(0.07)	(0.05)	(0.04)	(0.08)	(0.08)	(0.06)
$perc_{j,t} - perc_t$	0.06	0.04	-0.04	-0.12**	0.06	-0.06	0.03	-0.06	-0.01	-0.04	0.02
	(0.07)	(0.09)	(0.06)	(0.06)	(0.07)	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)	(0.06)
cons	0.23***	0.20***	0.23***	0.23***	0.36***	0.27***	0.21***	0.14***	0.22***	0.18***	0.31***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
R^2	0.090	0.072	0.104	0.210	0.093	0.090	0.129	0.168	0.117	0.159	0.105
N	134				134				134		

Note: Unconstrained SUR regressions. *<0.1, **<0.05, *** p<0.01. Sample 1999M1-2010M3. S.e.'s in brackets.

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