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

Jan-Oliver Menz†
Deutsche Bundesbank

Philipp Poppitz
Universität Hamburg

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Abstract

Inflation expectations are often found to depend on demographic characteristics of households, such as age, income and education, however, the reasons for this systematic heterogeneity are less clear. 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 effect on inflation expectations using data for Germany. Overall, our findings suggest that household-specific inflation rates and group-specific news consumption accounts for the higher forecast errors 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

JEL classification: C53, D84, E37

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†Corresponding author, e-mail:Jan-Oliver.Menz@bundesbank.de

1 INTRODUCTION

The reasons why households with low income, less 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 of certain groups, 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, 2002) and rational inattention (Sims, 2003) propose that households' inflation expectations move in line with the best available forecast in the economy in the long run. In 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.

This epidemiology model of expectation formation relies on three crucial assumptions. First, households have 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 can help explain demographic differences in inflation expectations. Regarding households' processing capacities, the literature on financial literacy (Lusardi and Mitchell, 2008, Bruine de Bruin et al., 2010) shows 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 et al., 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. The yellow press as well as TV channels with a focus on entertainment are 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, we expect state-funded TV channels 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 to state their expected 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 et al. (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 in Germany as well, albeit differences are not that large. Inflation expectations are higher for households with low income, young households and for the unemployed. In addition, young and old individuals show larger deviations in inflation expectations from professional forecasters than households of middle age. Moreover, deviations become larger with falling income, and the inflation expectations of unemployed individuals are less in line with experts' expectations than those of manual workers and self-employed. 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 and occupation groups, while the news effects do not differ between households of different age. We find that coverage of inflation in *Tagesschau*, Germany's most important TV evenings news show, has a larger effect on unemployed households and individuals with lower income. In addition, we observe stronger media effects from newspaper articles in *BILD*, Germany's most influential tabloid, for poorer households and unemployed, but with a negative sign suggesting that these household groups adjust their expectation more strongly than others. However, since the highest income group and self-employed individuals do not at all react to articles in *BILD*, we interpret this finding as being responsible for the higher volatility of inflation expectations of poorer and unemployed households.

We start our paper with a detailed summary of the different sources of households' disagreement on inflation expectations that have been proposed in the literature, and discuss how the various determinants of heterogeneous forecasts can be used to explain the demographic differences in inflation expectations. We then describe the data set and our estimation strategy, before presenting our results and discussing directions of further research.

2 SOURCES OF HOUSEHOLDS' DISAGREEMENT ON INFLATION EXPECTATIONS

A number of studies, often conducted by central banks, have documented a direct impact of demographic characteristics on households' inflation expectations. Most of the studies thereby use data on the micro level, with Pfajfar and Santoro (2009) as the only paper that uses survey data on the household level. We briefly summarize the results and refer to Table (A.3) in the appendix 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 more 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 Strömberg (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.

We now classify the various determinants of inflation expectations disagreement[1] of households proposed in the literature since this helps clarify how our approach fits into this framework.[2] We illustrate our proposed summary in Figure (1). In our brief literature review, we have documented the impact of demographic characteristics on inflation expectations. Due to data availability, we

[1] In what follows, we use the terms " disagreement" and "heterogeneity" interchangeable.

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

focus on three groups in our empirical analysis, namely income, age, and occupation. 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 made use of these channels in order to explain demographic differences in inflation expectations.

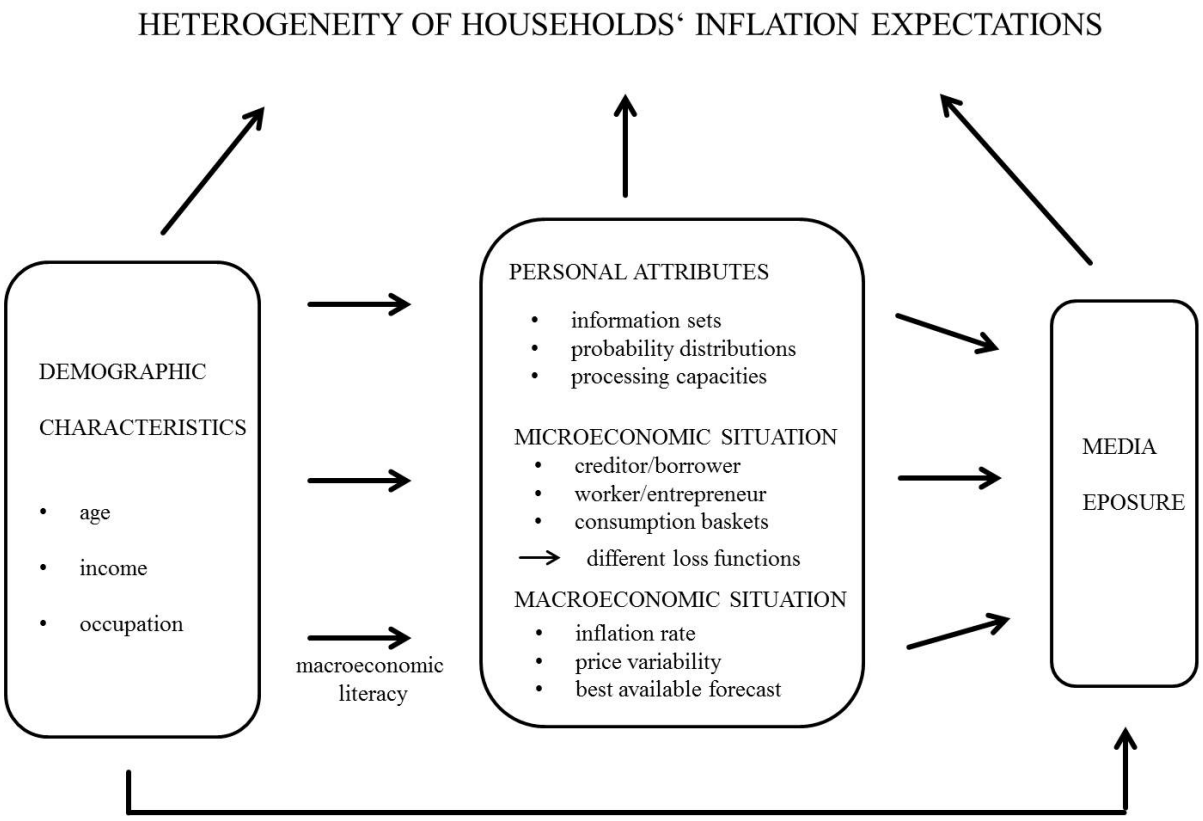


Figure 1: Driving Forces of Households' Disagreement on Inflation Expectations

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 (2002, 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 à la 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.
Each of these models make 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.[3] 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[4], 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 Despite 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

[3] For example, the highest age category used by Burke and Manz (2011) is "older than 32".
[4] 40% of respondents are interviewed a second time six months after the first interview.

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 overall inflation.[5] 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. As it was argued by Jonung (1981): Women tend 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) find some support for the view that households are better in forecasting their group-specific inflation rate instead of CPI inflation. They find that for households with a low and middle income, 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. Hence, this suggests that individuals with lower education levels think more of their group-specific inflation rate instead of overall CPI inflation. Anderson et al. (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. This might stem from the fact that the CPI categories are not precise enough in measuring household-specific consumption spending.

It is worth noting that, apart from different cost-benefit-analysis arising from the household's microeconomic situation, households' dependence on individual inflation rates can also be explained by 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-

[5] Indeed, Inoue et al. (2009) show that inflation expectations derived form households' spending pattern outperform survey measures in forecasting CPI inflation.

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 Households do not only get information on inflation by daily experience, but also from newspaper articles and TV reports (Carroll, 2003, Dräger, 2011, Lamla and Lein, 2010, Menz and Brandt, 2012). Media Consumption differs across demographic groups. As an example, Schoenbach et al. (1999) find that in Germany, males, older households, better educated and households with higher income read newspapers more frequently compared to others. Hence, the demographic differences in inflation expectations might stem from different news media consumption on the one hand, and from reading different newspapers and watching different TV channels on the other hand.

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.[6] 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 effects 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, Maag and Lamla (2009) 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.

Summing up, while a number of explanations have been proposed to explain the demographic effect on inflation expectations, the literature seems far from a consensus. We add to the previous work

[6] 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, hence we use "deviation from experts" interchangeably for forecast error.

by including as many explanatory factors of forecast disagreement as possible which allows us to assess their relative impact. More precisely, we separate German households according to age, income, and occupation, and try to relate their expectation differentials to group-specific inflation rates, group-specific inflation perceptions, and to a number of media sources.

3 DATA

This section describes the data on household-specific inflation expectations and perceptions, group-specific inflation rates, professional forecasters' expectations and the media data in detail. All data sources can be found in Table (A.1) in the appendix.

The household-specific inflation expectations and perceptions are taken from the Consumer Survey conducted by the European Commission (EC), whereas households' inflation rates stem from Eurostat. Unfortunately, the demographic categories of the EC survey do not match entirely with the categories of 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 about their inflation expectations: "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. The underlying micro data is not available. As a raw measure of qualitative inflation expectations, the so-called balance statistic is widely used. It is calculated as:

$$\pi^{bal} = pp + p/2 - m/2 - mm \tag{1}$$

pp : % of "rise a lot"

p : % of "rise moderately"

m : % of "stay about the same"

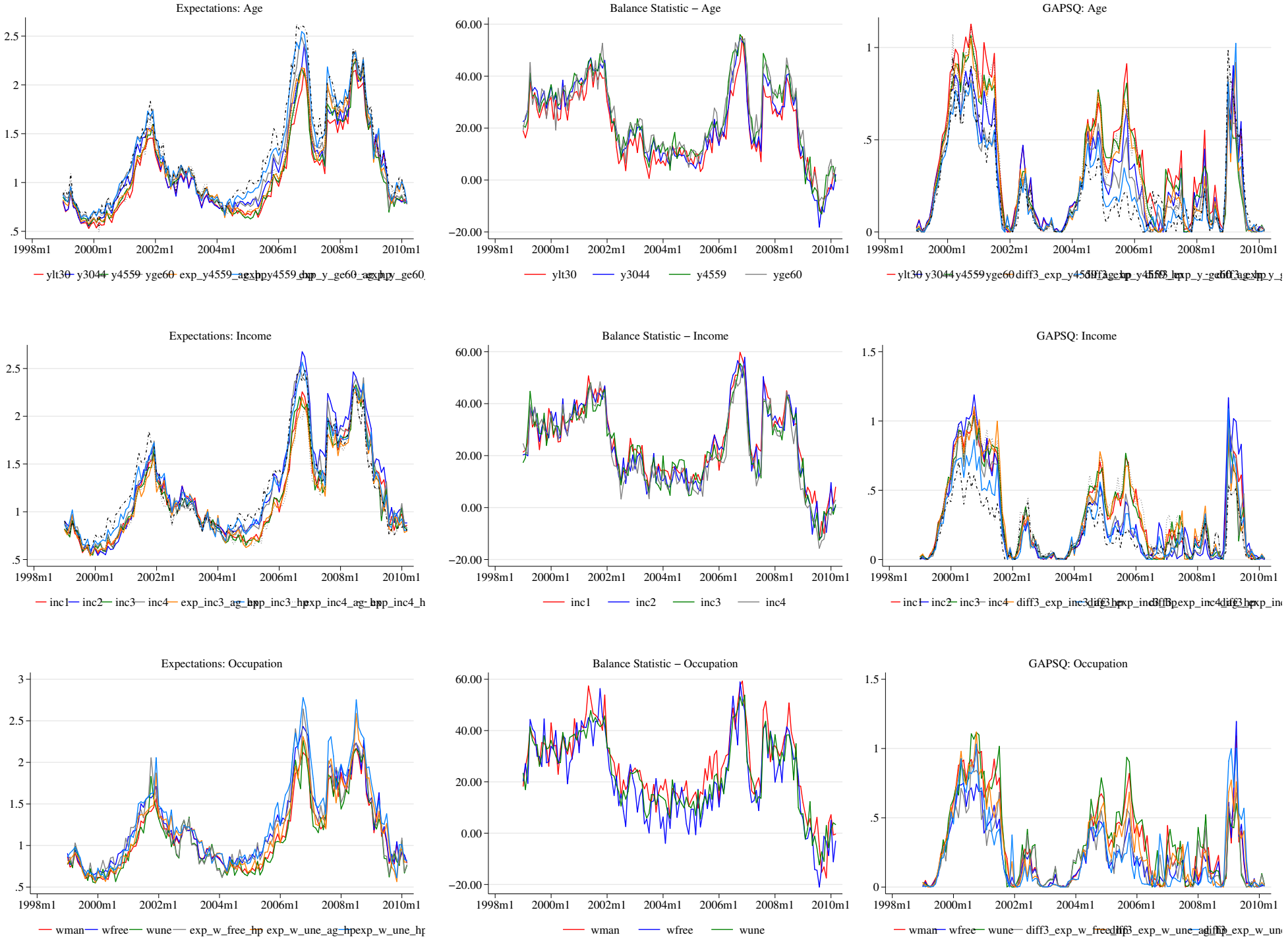
mm : % of "fall"

Hence, if the balance statistic has a value of 100, all consumers think that prices will rise a lot, whereas a value of 0 means that half of the respondents belief prices to rise whereas the remaining half thinks that prices will stay about the same or will even fall. In order to get a more precise figure for inflation expectations, we quantify the original data using the *probability method* originally proposed by Carlson and Parkin (1975) and extended by Batchelor and Orr (1988), see Dräger et al. (2011) for details. For the purpose of our analysis, it is important to note that we have to use a variable to scale the qualitative data. Instead of the usually employed HP-filtered aggregate inflation, we scale households' inflation expectations and perceptions using the household-specific inflation rates.

Figure (2) plots the quantified inflation expectations for the three household groups (first column) together with the balance statistic (second column). As it turns out, the differences of quantified inflation expectations are relatively minor across demographic groups.[7] Part of these small differences might be due to the quantification procedure: All expectations series are scaled by the HP-trend of household inflation over the past 20 periods, and since the trend inflation is very similar, this also narrows the differences in households' expectations. However, the differences between households using the balance statistics are rather similar.

[7] This is in line with findings of Gnan et al. (2011) who show that the within-group disagreement does not differ much between household-groups in France, Germany, and Slovakia, while the remaining Euro Area countries exhibit much larger deviations.

Figure 2: Household-specific Inflation Expectations - Quantified and Balance Statistics



In order to get a better idea whether the general findings with regard to the demographic expectation differentials also hold in our sample, we report the mean and the standard deviation of the single series over time, together with the root mean squared error (RMSE) between households' inflation expectations and inflation rates. The results in Table (2) show that the older the households, the higher their expectations. Furthermore, 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. However, 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. Using the balance statics generally replicates the reported findings. With regard to income, we now find that rising earnings lead to lower expectations.

Table 2: Summary Statistics of Inflation Expectations

	quantified expecations			balance statistic		GAPSQ	
	mean	sd	RMSE	mean	sd	mean	sd
prof	1.497	0.471	0.944	.	.	.	.
all	1.118	0.442	1.122	22.279	14.683	0.309	0.303
ylt30	1.144	0.449	1.171	19.452	13.807	0.273	0.258
y3044	1.203	0.478	1.187	21.683	15.532	0.231	0.233
y4559	1.253	0.500	1.166	23.783	15.138	0.213	0.232
yge60	1.283	0.509	1.177	24.135	14.464	0.213	0.246
inc1	1.264	0.548	1.255	24.823	14.444	0.272	0.329
inc2	1.226	0.514	1.192	23.770	15.571	0.253	0.283
inc3	1.237	0.482	1.169	23.254	14.691	0.219	0.240
inc4	1.240	0.471	1.151	21.623	15.454	0.181	0.177
wman	1.221	0.460	1.152	23.013	14.741	0.218	0.231
wfree	1.209	0.481	1.164	21.110	16.691	0.224	0.222
wune	1.296	0.540	1.267	25.999	15.220	0.227	0.268

Note: Sample 1999m1-2010m3. RMSE computed using household inflation.

In our subsequent estimations, we do not use households' inflation expectations as dependent variables, but the squared differences of households' expectations $\pi_{j,t}^{exp,hh}$ and the expectations of professional forecasters $\pi_t^{exp,prof}$:

$$GAPSQ_{j,t} = \left(\pi_{j,t}^{exp,hh} - \pi_t^{exp,prof}\right)^2 \tag{2}$$

The data for professional forecasters' expectations is taken form Consensus Economics which surveys forecasters in public research institutes and private firms on a monthly basis. We follow Dovern et al. (forthcoming) and compute the mean expectations across forecasters.

We use the *GAPSQ* variable for two reasons. First, as it is shown by Carroll (2003), among others, households tend to adjust their expectations to the best available forecast in an economy which is captured by professional forecasters' expectations. Second, we decided to include experts' expectations via the *GAPSQ*, since this serves as a useful benchmark and facilitates the interpretation. Instead of testing whether single media variables or price changes of different goods increase or decrease the expectations of different households, we can check whether household groups adjust differently to the best available forecast, and whether the adjustment is influenced by the news media in different ways. The third column of Figure (2) plots the expectation gaps for each of the three household groups, the corresponding mean and standard deviation are shown in Table (2). House-

holds deviate considerably from experts' forecasts with the largest deviations in 2001 and 2009. Moreover, expectation gaps vary across households: low income households, unemployed and people younger than 30 deviate much more from expert forecasts on average. In addition, these groups also show larger fluctuations over time.

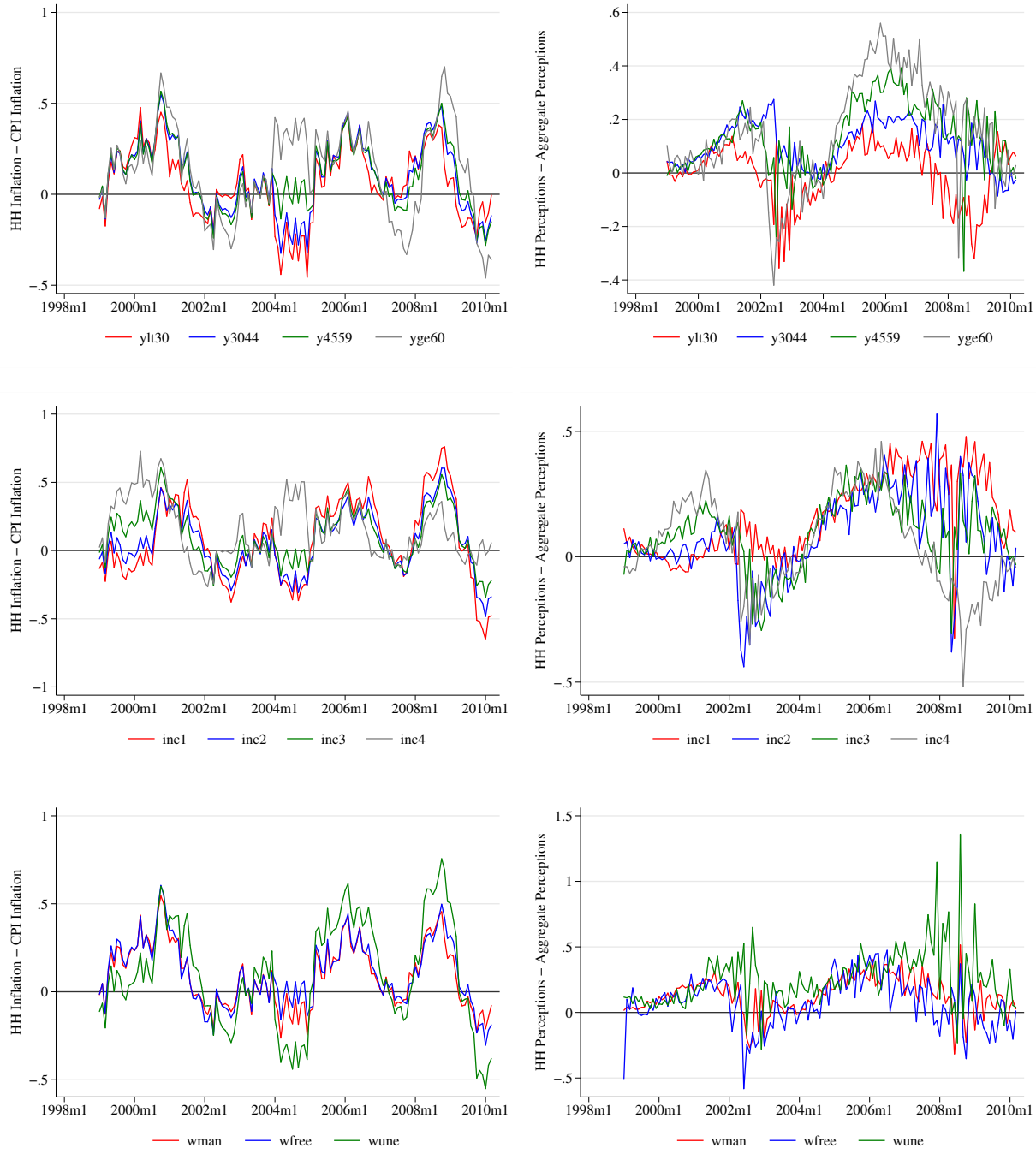
3.2 HOUSEHOLD-SPECIFIC INFLATION RATES AND PERCEPTIONS

The household-specific inflation rates of the socioeconomic groups in Table (1) are taken from Colavecchio et al. (2011). The authors compute these 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) of the European Commission. 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 to quantify the inflation perceptions using household-specific inflation rates.

The time series of households' inflation rates and perceptions of current inflation are plotted in Figure (A.1) in the appendix. Note that for both variables, there are only small differences between household groups. In our empirical analysis, we do not use these raw series, 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, $\pi_{j,t}^{perc} - \pi_t^{perc}$. The resulting series are shown in Figure (3). We use the inflation and perception differentials, because this accentuates the differences between the groups. Moreover, in using the differentials, we belief to be closer to the 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.

Figure 3: Differentials of HH-Inflation and HH-Perceptions

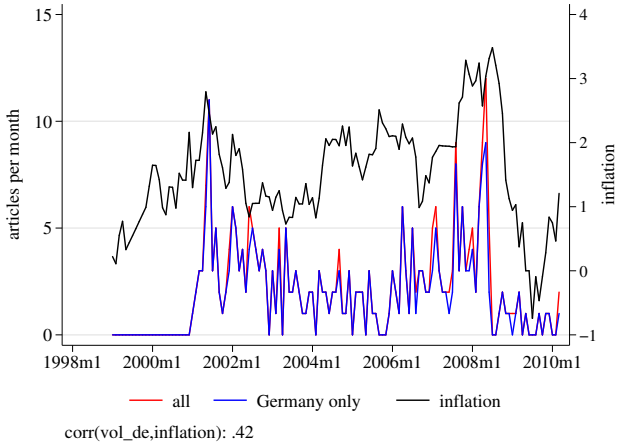


3.3 MEDIA DATA

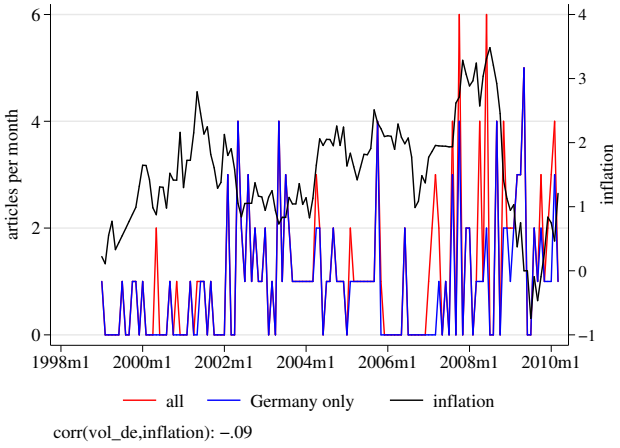
The media data is compiled by the media research institute *Media Tenor*[8]. Newspaper articles and television reports are searched for the keywords "inflation", "deflation", "price increase", "price cut", "price stability" and "oil price", followed by a human-based content analysis of the news reports that have been picked up. For example, we can 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*). For each month, we count the number of articles and TV reports that mention inflation (vol^{BILD}, $vol^{Spiegel}$,...) and normalize all series with its maximum over the sample in order to eliminate distortions due to different release frequencies and media specific levels of news coverage. Figure (4) and Figure (5) plot the monthly sum of articles for all countries and for Germany only, together with the annual inflation rate. 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 weekly magazines *Focus* and *Spiegel* exhibit very low news coverage of inflation. The public evening news *Tagesschau* and *Tagesthemen*, as well as *Heute* and *Heute Journal* cover inflation on a more regular basis than the private TV channels *RTl*, *SAT.1* and *Pro7*. Moreover, the correlation of news coverage with annual inflation varies between single media sources. Generally, we find a positive link with a correlation coefficient of about .4, but the news coverage of the *Tagesschau* and *Spiegel* react less strongly to inflation, and *Focus* shows even a slightly negative correlation.

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

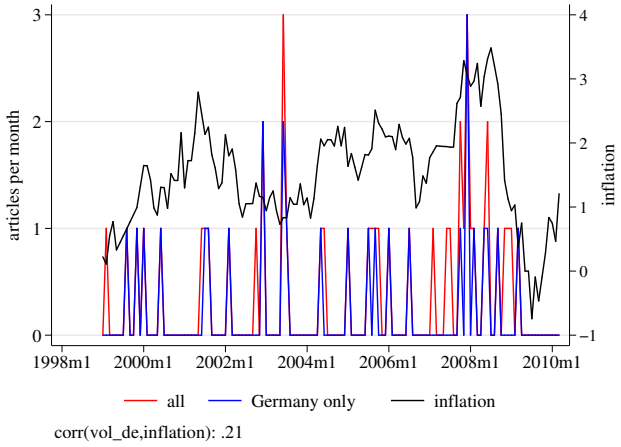
Figure 4: Media Coverage I



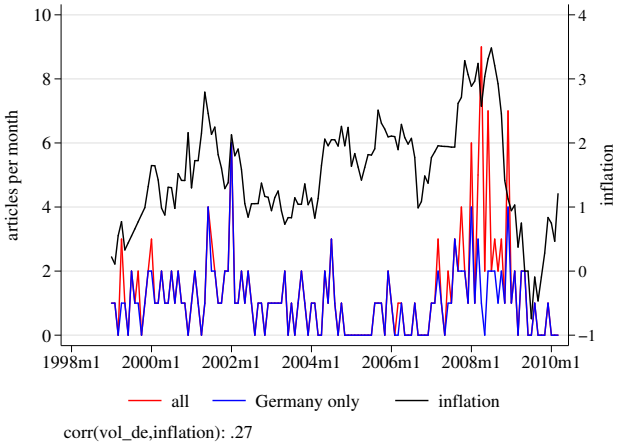
(a) Bild



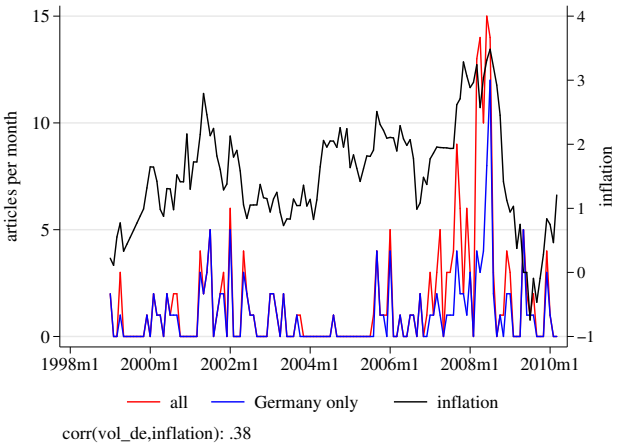
(b) Focus



(c) Spiegel

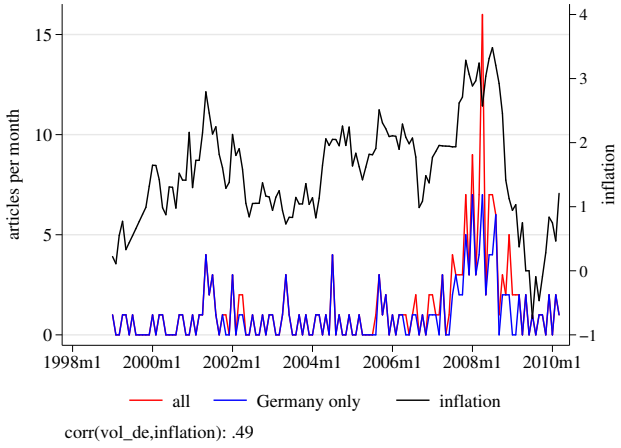


(d) Tagesschau

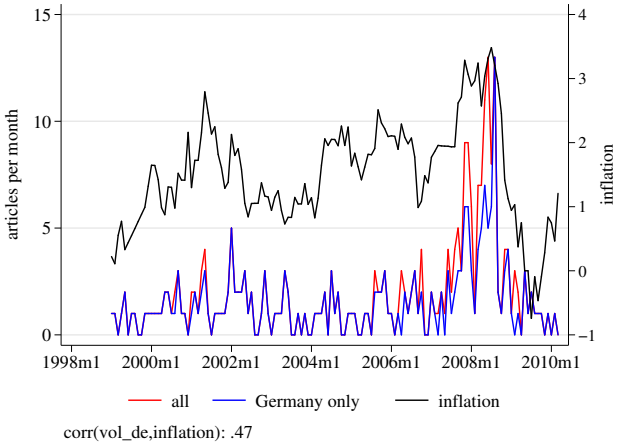


(e) Tagesthemen

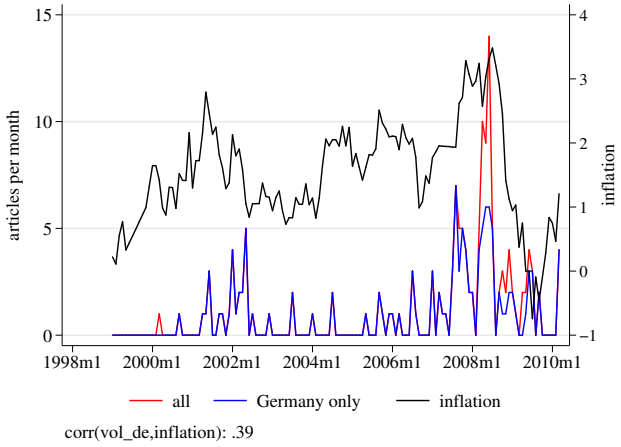
Figure 5: Media Coverage II



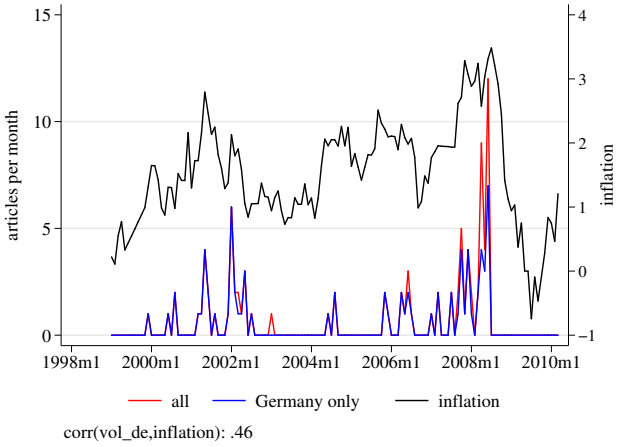
(a) Heute



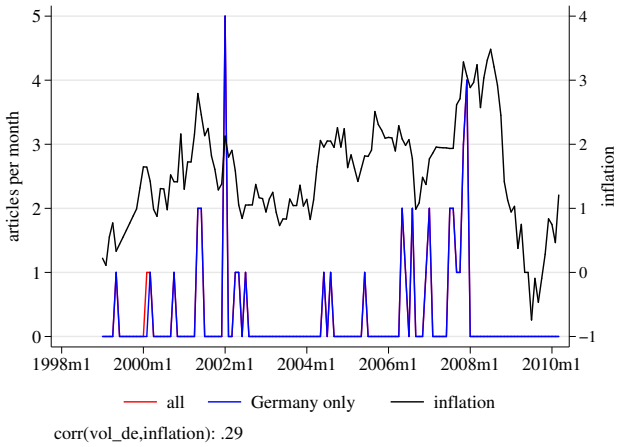
(b) Heute Journal



(c) RTL



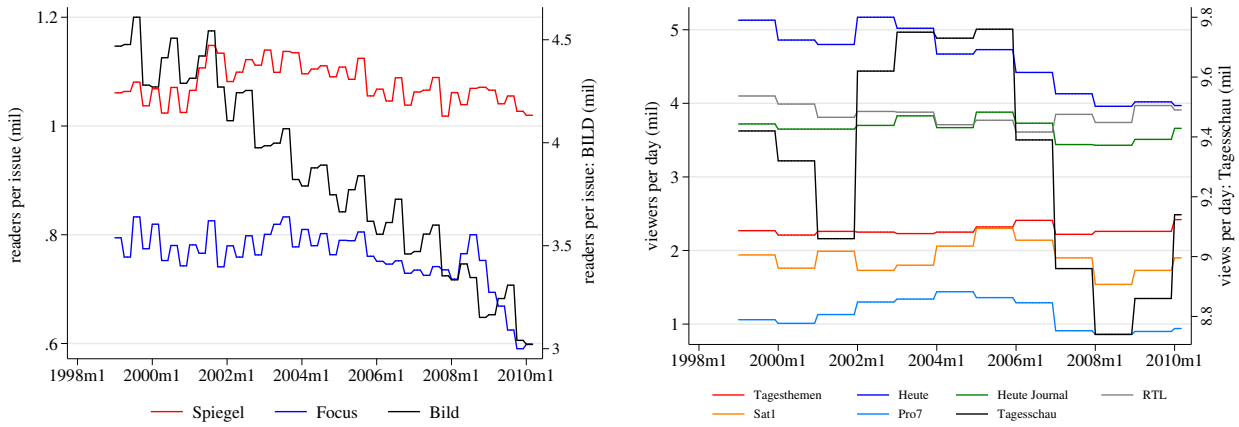
(d) Sat.1



(e) Pro7

Finally, the single media sources do not only differ with respect to their news coverage, but also with respect to their circulation. In Figure (6), we plot the average number of readers per newspaper issue and the average number of daily viewers of TV news shows. The daily *BILD* has by far the highest number of readers, albeit with a falling trend. By contrast, the numbers for the *Spiegel* remain fairly stable and slightly above 1 million readers, while the number of readers of the *Focus* fell below .8 million in 2007. With regard to TV news, the *Tagesschau* has nearly twice as many viewers than *Heute* which comes in second. Overall, the number of viewers remains stable over time, only *Heute* has been loosing viewers since 2005.

Figure 6: Newspaper Readers and TV Viewers



(a) Print readers

(b) TV viewers

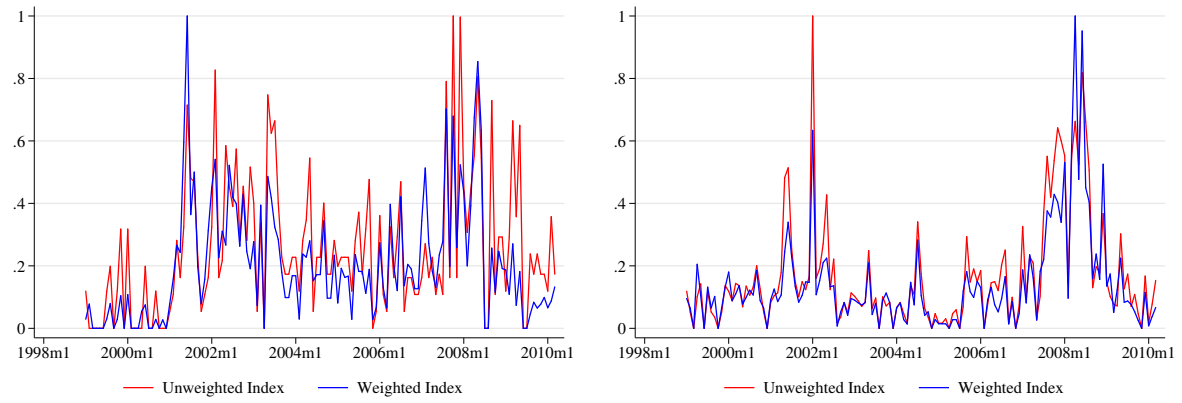
Due to these large differences in market penetration, we weight the number of articles on inflation with the corresponding number of viewers and readers. Note that we use only those articles that mention inflation in Germany. Unfortunately, the numbers are not directly comparable between print media and television, and data on relative news consumption for newspaper readers and TV viewers are not available. Hence, we calculate the weighted news media index separately for print and TV:

$$News_t^{pr\_index} = \frac{\left(vol^{BILD} \cdot circul^{BILD} + vol^{Spiegel} \cdot circul^{Spiegel} + vol^{Focus} \cdot circul^{Focus}\right)}{\max\left[\left(vol^{BILD} \cdot circul^{BILD} + vol_s^{Spiegel} \cdot circul^{Spiegel} + vol^{Focus} \cdot circul^{Focus}\right)\right]} \quad (3)$$

$$News_t^{tv\_index} = \frac{\left(vol^{Tagesschau} \cdot circul^{Bild} + vol^{Tagesthemen} \cdot circul^{Tagesthemen} + \ldots\right)}{\max\left[\left(vol_s^{Tagesschau} \cdot circul^{Tagesschau} + vol_s^{Tagesthemen} \cdot circul^{Tagesthemen} + \ldots\right)\right]} \quad (4)$$

We plot the unweighted and weighted media indices in Figure (7), for both print media and television. It turns out that the differences are larger for newspaper coverage. The high circulation of the *Tagesschau* increases the average level of news coverage in the print media, while the more volatile coverage of the widely read *BILD* results in larger differences in the TV index.

Figure 7: Differences between weighted an unweighted media

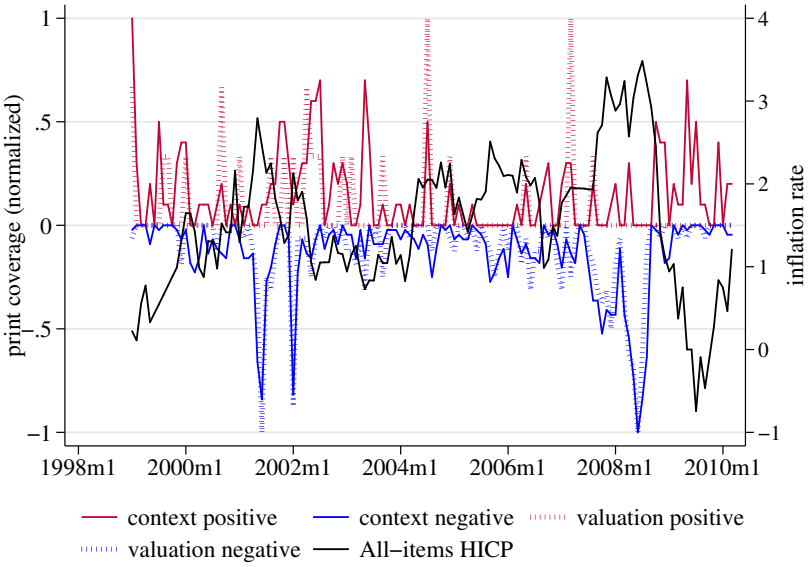


(a) Print media

(b) TV media

Finally, as it has been shown by Maag and Lamla (2009), not only the pure volume of media reports has an influence on households' inflation expectations, but also the subjective tone of the articles, i.e., the style in which journalists describe a topic. Our media data set allows us to include such a tone variable: more precisely, we distinguish 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 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. We plot the unweighted news index of the tone variables in Figure (8), together with the annual inflation rate.[9], Generally, we observe a rising number of negative reports and a decrease in positive articles if inflation rises.

Figure 8: Media Tone Variables



[9]Weighting the tone variables would double the number of variables, since we cannot compute the relative circulation of newspapers and TV

4 ESTIMATION STRATEGY

This section describes our estimation approach. As we have mentioned earlier, our dependent variable is the gap between households' inflation expectations and experts' forecast. Using this variable, we estimate three seemingly unrelated regressions (SUR) for the age groups, the income groups and the occupation groups, since we expect households across groups to react similar to aggregate shocks such as changes in oil prices or monetary policy. Moreover, this setting allows us to test whether the coefficients are significantly different between household groups. If we cannot reject the null hypothesis that coefficients are equal across group categories in each SUR estimations, we restrict the coefficients to be equal in order to increase the efficiency of the remaining estimates. We estimate three different settings.

First, we explain households' expectations with the aggregate inflation rate, the difference between household-specific inflation and aggregate inflation, the deviation of households' perceived inflation from aggregate inflation perceptions. Following Anderson et al. (2012), we include aggregate inflation with its first lag, assuming that households perceive aggregate inflation only with a month delay, while they realize the deviation of their own inflation rates from aggregate inflation immediately. In addition, we add the weighted newspaper index as well as the weighted TV news index. Correlation of the two news indices only reaches 0.4, so there should be no multicollinearity problem. The same is true for the correlation between household-specific inflation rates and inflation perceptions. Our first equation is:

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

Second, we replace the volume of news media coverage with the tone of media reports. 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 (0.8), however, this hardly affects the results. The second equation is given as:

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

Third, we disaggregate the news variables and include the number of articles and reports for each media source separately. This allows us to see whether some newspapers or TV channels have a stronger impact on households' inflation expectations than others. Furthermore, we can test whether the media effects are equal between demographic groups, or whether we can observe larger media effects for some households. Note that the news coverage is generally weakly correlated across single news media. Only *Heute* and *Heute Journal* show a correlation of 0.7, which is not surprising though since these two news shows belong to the same channel. Hence, the third equation is:

$$\begin{aligned} GAPSQ_{j,t} = {} & \alpha_{j,1} + \alpha_{j,2}\pi_{t-1} + \alpha_{j,3}News_t^{Bild} + \alpha_{j,4}News_t^{Focus} + \alpha_{j,5}News_t^{Spiegel} + \alpha_{j,6}News_t^{Tag} \\ & + \alpha_{j,7}News_t^{TT} + \alpha_{j,8}News_t^{Heute} + \alpha_{j,9}News_t^{Journal} + \alpha_{j,10}News_t^{RTL} + \alpha_{j,11}News_t^{SAT1} \\ & + \alpha_{j,12}\left(\pi_{j,t} - \pi_t\right) + \alpha_{j,13}\left(perc_{j,t} - perc_t\right) + \varepsilon_{j,t} \end{aligned} \tag{7}$$

5 RESULTS

We now discuss the results of our estimates in detail. First, we estimate unrestricted SUR models of the equations (5) - (7) and test the coefficients for both equality across groups and common significance. The results for the coefficient test are shown in Tables (A.4) - (A.6), the estimates of the unrestricted SUR models are available upon request. In what follows, we present results for SUR models where we set the coefficients to be equal if we cannot reject the null hypothesis of equal coefficients. Results for equation (5) are shown in Table (3).

Table 3: Results: GAPSQ, HH-Inflation and Media Index

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.04	0.03	-0.01	-0.02	-0.05	-0.02	-0.00	0.01	0.00	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)
$News_t^{pr\_index}$	-0.21*	-0.21*	-0.21*	-0.21*	-0.04	-0.04	-0.04	-0.04	-0.20*	-0.15	-0.35**
	(0.11)	(0.11)	(0.11)	(0.11)	(0.08)	(0.08)	(0.08)	(0.08)	(0.12)	(0.11)	(0.14)
$News_t^{tv\_index}$	-0.12	-0.09	0.04	0.11	-0.03	-0.03	-0.03	-0.03	-0.03	0.01	0.15
	(0.15)	(0.13)	(0.13)	(0.13)	(0.08)	(0.08)	(0.08)	(0.08)	(0.13)	(0.12)	(0.15)
$\pi_{j,t} - \pi_t$	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***	0.24***	0.24***	0.24***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)	(0.06)
$perc_{j,t} - perc_t$	-0.02	-0.02	-0.02	-0.02	-0.04	-0.04	-0.04	-0.04	-0.01	-0.01	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
cons	0.27***	0.23***	0.25***	0.25***	0.36***	0.29***	0.23***	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	0.001				0.000				0.000		
N	134				134				134		

Note: SUR regressions using constraints suggested in Table (A.4). *<0.1, **<0.05, *** p<0.01. Sample 1999m1-2010m3. S.e.'s in brackets.

Generally, lagged aggregate inflation does not have an impact on the gap between households' and professional forecasters' expectations. Only for the unemployed, we find a significant and negative coefficient, suggesting that rising aggregate inflation narrows the expectation gap. It seems that instead of looking at headline inflation, households use their group-specific inflation rates when forecasting inflation: across all groups, we find significantly positive coefficients. Hence, households deviate from experts' forecasts if their group-specific inflation rate differs from aggregate inflation. In addition, this effect does not vary across groups: we do not observe that low income households react more strongly to their individual inflation rate than high income households. 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.

With respect to the news media, we do not find any impact of television reports mentioning inflation. By contrast, for both age and occupation, newspaper articles are found to significantly reduce the gap between households' and experts' forecasts, while there is no effect if we separate households according to their income. Moreover, we find heterogeneous media effects for occupation groups: The self-employed are not affected by news coverage, while the unemployed react more strongly to newspaper reports than manual workers.

Overall, this first equation cannot explain the heterogeneity of households' inflation expectations with respect to their demographic groups. While households react to their group-specific inflation rate, the strength of this effect is the same between groups. Only for the unemployed, we find an impact from headline inflation and newspaper articles that is different from other groups.

Next, Table (4) shows the results using the tone of the news reports instead of the overall sum of newspaper articles and TV reports.

Table 4: Results: GAPSQ, HH-Inflation and Media Tone Index

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	-0.00	-0.01	-0.03	-0.04	-0.05	-0.02	-0.00	0.01	-0.02	0.01	-0.08**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)
$News_t^{pos\_con}$	-0.09	-0.09	-0.09	-0.09	0.00	0.00	0.00	0.00	-0.10	-0.10	-0.10
	(0.10)	(0.10)	(0.10)	(0.10)	(0.08)	(0.08)	(0.08)	(0.08)	(0.11)	(0.11)	(0.11)
$News_t^{neg\_con}$	0.51**	0.51**	0.51**	0.51**	0.15	0.15	0.15	0.15	0.30	0.25	0.57**
	(0.20)	(0.20)	(0.20)	(0.20)	(0.15)	(0.15)	(0.15)	(0.15)	(0.22)	(0.21)	(0.26)
$News_t^{pos\_val}$	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.16	0.16	0.16
	(0.10)	(0.10)	(0.10)	(0.10)	(0.08)	(0.08)	(0.08)	(0.08)	(0.10)	(0.10)	(0.10)
$News_t^{neg\_val}$	-0.56***	-0.56***	-0.56***	-0.56***	-0.24*	-0.24*	-0.24*	-0.24*	-0.41*	-0.36*	-0.68***
	(0.19)	(0.19)	(0.19)	(0.19)	(0.15)	(0.15)	(0.15)	(0.15)	(0.21)	(0.20)	(0.25)
$\pi_{j,t} - \pi_t$	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***	0.14***	0.25***	0.25***	0.25***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)	(0.06)
$perc_{j,t} - perc_t$	-0.02	-0.02	-0.02	-0.02	-0.04	-0.04	-0.04	-0.04	-0.01	-0.01	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
cons	0.26***	0.23***	0.25***	0.25***	0.35***	0.27***	0.21***	0.14***	0.23***	0.20***	0.33***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
R^2	0.001				0.000				0.000		
N	134				134				134		

Note: SUR regressions using constraints suggested in Table (A.5). *<0.1, **<0.05, *** p<0.01. Sample 1999m1-2010m3. S.e.'s in brackets.

This second estimation confirms our previous results. Households across all groups primarily react to changes in their groups-specific inflation rates, while neither aggregate inflation nor inflation perceptions are found to be significantly different from zero. Including the tone of the media reports leads to the following conclusion. In line with the findings of Lamla and Lein (2010), more articles with a negative tone increase the gap between households' and professional forecasters' expectations. Interestingly, this is only true if we use the narrow definition, i.e. the valuation variable. If we allow for a broader judgment, for all income groups, more negative reports narrow the gap. By contrast, more positive news coverage does not have an effect on households' expectations, no matter if the tone is narrowly or broadly defined.
We make some progress in explaining differences between groups. Once again, unemployed individuals are the only ones that react to headline inflation, and also to the number of negative articles broadly defined. More importantly, we find varying news effects across occupation groups: manual workers deviate more from experts in response to more articles with a negative tone compared to self-employed individuals, while the by far largest effect can be observed for the unemployed. Since this pattern matches the differences in expectation gaps across occupation groups, some part of the demographic differences could be explained with varying responsiveness to negative news.

Finally, we split the news indices and include the number of news reports of each newspaper or TV show separately. Table (5) shows the results. As before, we find only a weak impact of aggregate inflation. The unemployed do not react anymore to overall inflation, while rising prices increase the gap for individuals younger than 45. With regard to the relative influence of households' inflation rates and inflation perceptions, this third equation as well supports our previous findings. Overall, people's inflation expectations are more strongly related to their spending habits than to their judgment of the current inflation rate. In contrast to our estimates above, we now find considerable heterogeneity between groups. With regard to age, only the young and the old react significantly to price differentials, with a stronger effect for the latter. This partly explains the pattern in the expectation gaps: people younger than 30 have the highest deviation from experts on average, while the gap of individuals older than 60 varies more over time compared to middle-aged households. Distinguishing households with respect to their income and occupation reveals heterogeneous effects of price differentials as well. First, the poorer the households, the stronger the impact of their specific inflation rate. Since the expectation gap also rises with falling income, part of this effect can be explained with a different focus on individual inflation rates between income groups. Second, group-specific inflation rates are also heterogeneous between occupation groups, however, the

effect is lowest for the unemployed who deviate most from experts' expectations.

Turning to the media effects, we do not observe heterogeneous media consumption across age groups. Only articles published in the widely read *BILD* are found to narrow the expectation gap, while news reports in Germany's leading evenings news show *Tagesschau* widens the difference between households' and experts' inflation expectations. Regard income and occupation groups, we observe strong heterogeneous effects. Households in the highest income quartile are not influenced by articles in *BILD*, while this newspaper exerts a rising impact the lower the income. The same holds true for TV reports in the *Tagesschau*, but with a positive impact on the gap. Moreover, we also observe a significantly negative impact from *RTL*, the private TV channel with the highest number of viewers. Finally, with regard to occupation groups, our results show the largest news effects for the unemployed. Again, articles in *BILD* lower the gap, and reports in the *Tagesschau* lead to larger deviations. In addition, we find a significantly negative impact from TV reports in *Heute Journal*. It seems puzzling that the *Tagesschau* drives away households' from the best available forecast, while all other news media, especially *BILD* have the opposite effect, since the former is associated with reputable quality journalism, while the latter is Germany's leading tabloid. We think that part of this surprising result stems from the fact that public TV news show *Tagesschau*, due to its educational mandate, reports inflation on a rather regular and neutral basis without overemphasizing unusual price changes.

Summing up, we find that households deviate from professional forecasters' expectations if price changes of their representative goods categories differ from aggregate inflation, and if the tone of media reports becomes more negative. By contrast, more news coverage generally lowers the gap. In addition, our results suggest strong heterogeneity of news effects between groups and single news media, as well as for individual inflation rates. Hence, part of the demographic differences of households' inflation expectations can be explained by group-specific media consumption.

Table 5: Results: GAPSQ, HH-Inflation and Single News Media

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
π_{t-1}	0.05*	0.05*	0.02	0.01	-0.03	0.02	0.02	0.03	0.03	0.04	-0.03
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)
$News_t^{Bild}$	-0.24**	-0.24**	-0.24**	-0.24**	-0.42***	-0.30**	-0.26**	-0.12	-0.27**	-0.18	-0.39***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.16)	(0.14)	(0.11)	(0.09)	(0.12)	(0.11)	(0.14)
$News_t^{Focus}$	0.00	0.00	0.00	0.00	0.00	-0.08	-0.01	-0.02	0.08	0.08	0.08
	(0.08)	(0.08)	(0.08)	(0.08)	(0.12)	(0.10)	(0.08)	(0.06)	(0.08)	(0.08)	(0.08)
$News_t^{Spiegel}$	-0.06	-0.06	-0.06	-0.06	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08
	(0.11)	(0.11)	(0.11)	(0.11)	(0.08)	(0.08)	(0.08)	(0.08)	(0.11)	(0.11)	(0.11)
$News_t^{Tagesschau}$	0.34***	0.34***	0.34***	0.34***	0.44**	0.35**	0.23*	0.22**	0.22*	0.31***	0.43***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.17)	(0.15)	(0.12)	(0.09)	(0.13)	(0.12)	(0.15)
$News_t^{Tagesthemen}$	0.01	0.01	0.01	0.01	-0.04	-0.19	-0.00	-0.08	0.08	0.08	0.08
	(0.16)	(0.16)	(0.16)	(0.16)	(0.22)	(0.19)	(0.16)	(0.12)	(0.16)	(0.16)	(0.16)
$News_t^{Heute}$	-0.14	-0.14	-0.14	-0.14	-0.04	-0.04	-0.04	-0.04	-0.05	0.08	-0.12
	(0.13)	(0.13)	(0.13)	(0.13)	(0.09)	(0.09)	(0.09)	(0.09)	(0.13)	(0.13)	(0.15)
$News_t^{HeuteJournal}$	-0.12	-0.12	-0.12	-0.12	-0.04	-0.04	-0.04	-0.04	-0.34*	-0.34*	-0.34*
	(0.18)	(0.18)	(0.18)	(0.18)	(0.13)	(0.13)	(0.13)	(0.13)	(0.18)	(0.18)	(0.18)
$News_t^{RTL}$	-0.11	-0.11	-0.11	-0.11	-0.14*	-0.14*	-0.14*	-0.14*	-0.13	-0.26**	-0.05
	(0.11)	(0.11)	(0.11)	(0.11)	(0.08)	(0.08)	(0.08)	(0.08)	(0.12)	(0.11)	(0.13)
$News_t^{Sat1}$	0.08	0.08	0.08	0.08	0.14	0.14	0.14	0.14	0.17	0.17	0.17
	(0.14)	(0.14)	(0.14)	(0.14)	(0.10)	(0.10)	(0.10)	(0.10)	(0.14)	(0.14)	(0.14)
$News_t^{Pro7}$	-0.02	-0.02	-0.02	-0.02	-0.06	-0.06	-0.06	-0.06	-0.13	-0.13	-0.13
	(0.13)	(0.13)	(0.13)	(0.13)	(0.09)	(0.09)	(0.09)	(0.09)	(0.13)	(0.13)	(0.13)
$\pi_{j,t} - \pi_t$	0.10*	0.05	0.08	0.14***	0.16***	0.16***	0.16***	0.16***	0.23***	0.23***	0.23***
	(0.06)	(0.05)	(0.06)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)
$perc_{j,t} - perc_t$	-0.03	-0.03	-0.03	-0.03	0.02	-0.14***	-0.02	-0.10**	0.01	0.01	0.01
	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.05)	(0.04)	(0.03)	(0.03)	(0.03)
cons	0.22***	0.19***	0.21***	0.22***	0.34***	0.28***	0.22***	0.14***	0.20***	0.16***	0.28***
	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
R^2	0.033				0.000				0.000		
N	134				134				134		

Note: SUR regressions using constraints suggested in Table (A.6). *<0.1, **<0.05, *** p<0.01. Sample 1999m1-2010m3. S.e.'s in brackets.

6 DEVIATIONS FROM AGGREGATE EXPECTATIONS

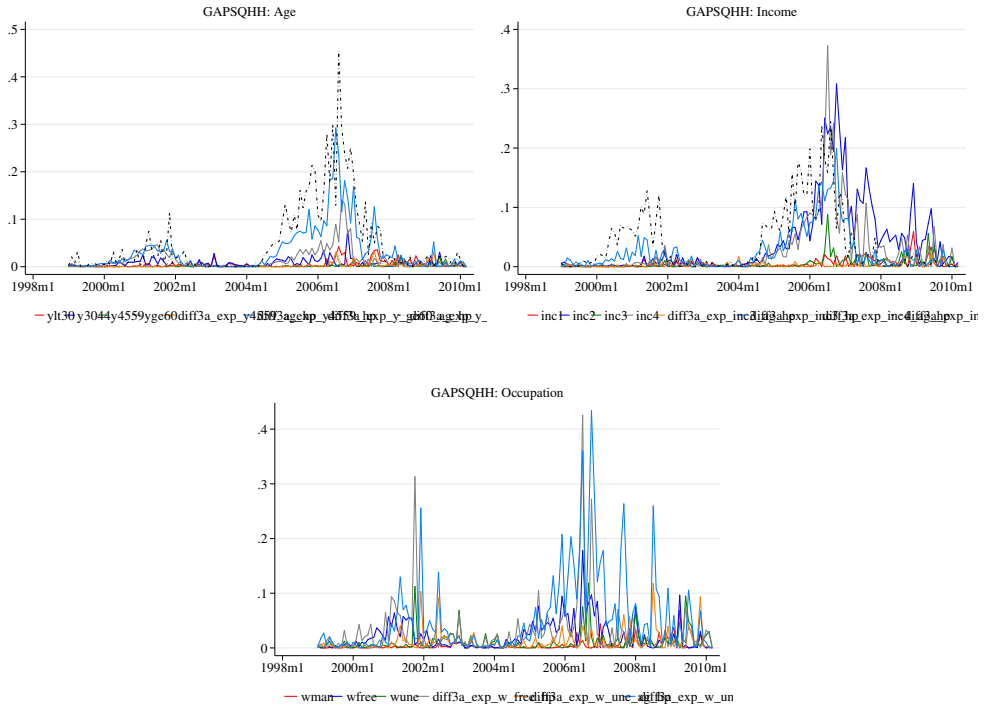
So far, we have analyzed the differences of household-specific inflation rates with respect to professional forecasters' expectations. We use expert forecasts, since these serve as a proxy for the best available forecast in the economy and hence come closest to rational expectations. From a theoretical perspective: macroeconomic models either use one representative agent forming rational expectations, or allow for heterogeneous agents but keep rational expectations as the benchmark, as for example the sticky information model of Mankiw and Reis (2002). Hence, we think that it is the gap between experts and households with different demographic background that is most relevant and should thus be the main focus of analyzing demographic differences in inflation expectations.

Nevertheless, we could also explore why households with different socioeconomic characteristics deviate from aggregate household expectations. In fact, many studies using micro data compare the expectations of single individuals with respect to a representative household with middle income, middle age, and education. In this section, we reestimate our previous models by replacing the gap between households and professionals with the difference between group-specific and aggregate expectations:

$$GAPSQHH_{j,t} = \left(\pi_{j,t}^{exp,hh} - \pi_{t}^{exp,hh}\right)^2 \tag{8}$$

We plot the expectation gaps of households in Figure (9). The time series look quite different compared to the gap between households and experts shown in the third column of Figure (2). The size of the deviations of the household gap is much smaller compared to the deviations from experts. Only at the beginning of 2006, we observe a pronounces expectation gap, whereas at the same time, households' expectations are fairly close to those of experts. Generally, households' expectation gap rises with age; low income and high income groups deviate more than middle income groups, and unemployed individuals exhibit a larger gap (see Table (A.2) in the appendix).

Figure 9: Household-Specific Expectations - Aggregate Expectations



We now repeat our previous estimates using $GAPSQHH_{j,t}$ as the dependent variable. Since experts are still found to exert significant impact on households' inflation expectations, we include professional forecasters' expectations $\pi_t^{exp,prof}$ as additional explanatory variable. Again, we first estimate unrestricted SUR models, test for coefficient equality across equations (see Tables (A.7) - (A.9) in the appendix), and impose equality constraints if the tests do not indicate otherwise.

The results of the first restricted SUR estimation using the print media index and the TV index only are shown in Table (6). Broadly speaking, the estimates are fairly different compared to the deviations from experts. We now find a significant and negative impact from aggregate inflation, while inflation differentials are generally not significant, in contrast to perception differentials that increase the gap between group-specific and aggregate expectations. In addition, the print media index plays a minor role, while TV reports are found to narrow the expectation gap. The effect from experts' forecast is also significant and of a positive sign, thus increasing the gap.

We observe considerable heterogeneity between groups. The older the households, the larger the impact from experts, headline inflation, TV news, and inflation perceptions. Hence, our model explains the rising expectation gap across age groups fairly well. With regard to income groups, we observe larger coefficients for experts' expectations, headline inflation and inflation perceptions for low income households. Finally, classifying households according to occupation replicates some of our previous findings. Newspaper articles and inflation differentials are found to have a significantly positive impact on the expectation gaps. In addition, we find that the unemployed react more strongly to professional forecasters' expectations and headline inflation.

Table 6: Results: GAPSQHH, HH-Inflation and Media Index

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
$\pi_t^{exp,prof}$	0.01**	0.04***	0.07***	0.10***	0.09***	0.06***	0.05***	0.03***	0.02**	0.05***	0.11***
	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
π_{t-1}	-0.00	-0.01***	-0.02***	-0.05***	-0.04***	-0.02**	-0.01***	0.00	-0.00	-0.02***	-0.04***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)
$News_t^{pr\_index}$	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.04***	0.04***	0.04***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$News_t^{tv\_index}$	-0.02***	-0.03***	-0.04**	-0.07***	-0.02	-0.06**	-0.07***	-0.06***	-0.04***	-0.04***	-0.04***
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
$\pi_{j,t} - \pi_t$	0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$perc_{j,t} - perc_t$	0.01*	0.08***	0.15***	0.23***	0.21***	0.08***	0.08***	0.16***	0.07***	0.07***	0.07***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
cons	0.00	-0.02***	-0.05***	-0.06***	-0.07***	-0.04***	-0.03***	-0.01	-0.01	-0.02	-0.07***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
R^2	0.001				0.000				0.000		
N	134				134				134		

Note: SUR regressions using constraints suggested in Table (A.7). *<0.1, **<0.05, *** p<0.01. Sample 1999m1-2010m3. S.e.'s in brackets.

Replacing the news indices with the tone of media reports yields the results in Table (7). First, we get the same results for professional forecasters' expectations, headline inflation, group-specific inflation rates and perceptions. With regard to the news media, we find a significant and negative impact from positive news when separating households according to their age. In contrast, negative news broadly defined increase the expectation gap, while for income groups, articles with a negative tone in a narrow sense decrease the gap. There is not much heterogeneity of the media effects, only the impact of negative news rises if individuals grow older.

Table 7: Results: GAPSQHH, HH-Inflation and Media Tone Index

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
$\pi_t^{exp,prof}$	0.01**	0.04***	0.07***	0.11***	0.09***	0.07***	0.06***	0.03***	0.02***	0.05***	0.12***
	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
π_{t-1}	-0.00	-0.02***	-0.02***	-0.05***	-0.04***	-0.02**	-0.02***	0.00	-0.00	-0.02**	-0.04***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
$News_t^{pos\_con}$	-0.01**	-0.01**	-0.01**	-0.01**	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$News_t^{neg\_con}$	-0.02*	-0.03**	-0.04**	-0.07**	-0.08***	-0.08***	-0.08***	-0.08***	-0.05**	-0.05**	-0.05**
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$News_t^{pos\_val}$	-0.00	-0.00	-0.00	-0.00	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$News_t^{neg\_val}$	0.01	0.01	0.01	0.01	0.05**	0.05**	0.05**	0.05**	0.03	0.03	0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$\pi_{j,t} - \pi_t$	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.02*	0.02*	0.02*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$perc_{j,t} - perc_t$	0.01	0.09***	0.15***	0.23***	0.21***	0.08***	0.08***	0.17***	0.07***	0.07***	0.07***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
cons	0.00	-0.03***	-0.05***	-0.06***	-0.07***	-0.04***	-0.03***	-0.01	-0.01	-0.02	-0.07***
	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
R^2	0.002				0.000				0.000		
N	134				134				134		

Note: SUR regressions using constraints suggested in Table (A.8). *<0.1, **<0.05, *** p<0.01. Sample 1999m1-2010m3. S.e.'s in brackets.

Finally, we turn to the estimates using the single news media. Again, the results in Table (8) replicate the previous findings for the influence of experts, inflation rates and perceptions. With respect to news coverage, we find that some media increase the expectation gap (*BILD*, *Focus*, *Pro7*), while others lower the deviations (*Tagesschau*, *Heute Journal*, *Sat1*). Generally, the media effects do not differ between household groups, only for *Tagesschau* and *Pro7*, we observe larger media for older households.

Table 8: SUR Model: GAPSQHH, HH-Inflation and Single News Media

	ylt30	y3044	y4559	yge60	inc1	inc2	inc3	inc4	wman	wfree	wune
$\pi_t^{exp,prof}$	0.00	0.04***	0.06***	0.10***	0.09***	0.06***	0.05***	0.04***	0.02*	0.05***	0.11***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
π_{t-1}	-0.00	-0.01***	-0.02***	-0.05***	-0.04***	-0.02***	-0.01***	0.00	-0.00	-0.02**	-0.04***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)
$News_t^{Bild}$	0.01*	0.01*	0.01*	0.01*	-0.01	0.03	0.03**	-0.02	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
$News_t^{Focus}$	-0.00	-0.00	-0.00	-0.00	0.02	0.02	0.02	0.02	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$News_t^{Spiegel}$	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.01	0.01	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$News_t^{Tagesschau}$	-0.01**	-0.02**	-0.07***	-0.09***	-0.05***	-0.05***	-0.05***	-0.05***	0.00	-0.05*	-0.02
	(0.01)	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)
$News_t^{Tagesthemen}$	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$News_t^{Heute}$	-0.00	-0.00	-0.00	-0.00	-0.02	-0.02	-0.02	-0.02	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$News_t^{HeuteJournal}$	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.06***	-0.06***	-0.06***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$News_t^{RTL}$	-0.00	-0.01	0.03*	-0.01	0.02	0.02	-0.02	0.01	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
$News_t^{Sat1}$	-0.00	-0.01	-0.06***	-0.01	0.02	-0.05**	-0.03*	-0.05**	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$News_t^{Pro7}$	0.00	0.01	0.09***	0.08***	0.05***	0.05***	0.05***	0.05***	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$\pi_{j,t} - \pi_t$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03**	0.03**	0.03**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$perc_{j,t} - perc_t$	0.01	0.08***	0.15***	0.23***	0.21***	0.08***	0.09***	0.17***	0.07***	0.07***	0.07***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
cons	0.00	-0.02***	-0.04***	-0.05***	-0.06***	-0.04***	-0.03***	-0.02	-0.01	-0.01	-0.07***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
R^2	0.026				0.000				0.000		
N	134				134				134		

Note: SUR regressions using constraints suggested in Table (A.9). *<0.1, **<0.05, *** p<0.01. Sample 1999m1-2010m3. S.e.'s in brackets.

Summing up, we can separate the explanatory variables into two groups, the first increasing the gap between group-specific expectations and the second narrowing the differences in expectations. The first group consists of expert expectations, negative media reports and the differentials of house-

holds' inflation rates and perceptions. This makes sense intuitively: if households' group-specific perceptions deviate from aggregate perceptions, this will also be reflected in expectations. The same holds true for differences between households' inflation rates and aggregate inflation. The positive impact of experts could arise because households' link these forecasts to their group-specific inflation rates instead of overall inflation. And the positive effect of negative news reports might make households' more anxious resulting in deviations from aggregate expectations. Second, we find that positive media coverage, TV reports and headline inflation reduce the expectation gap. We interpret this finding such that if households' observe an increase in aggregate inflation, they will focus less on their group-specific prices and instead adjust to the overall price level. The same argument might apply to TV reports, since television news shows mainly report changes of the aggregate inflation rate. And a more positive tone in media reports reduces inflation fears among the general public and thus reduces the disagreement between households. Finally, it is worth noting that the heterogeneity between households' expectation differentials is mainly explained by differences in consumption patterns, perceptions and expert expectations. By contrast, we cannot observe heterogeneous media effects as in the case of the gap between households' and experts' expectations.

7 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. 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 households' inflation rates and news media consumption as main determinants of expectations. 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 also react more strongly to news reports in *Tagesschau*. A similar effect could be observed for unemployed individuals. Overall, this is the first study that successfully accounts for demographic differences in inflation expectations by using group-specific inflation rates and media consumption.

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 rise 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. Finally, 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 the demographic differences are more pronounced.

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Appendix

A ADDITIONAL TABLES AND FIGURES

Table A.1: 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

Table A.2: Summary Statistics of $\pi_{j,t}^{exp,hh} - \pi^{exp}, hh_t$

	mean	sd
ylt30	0.007	0.010
y3044	0.015	0.023
y4559	0.033	0.049
yge60	0.050	0.077
inc1	0.041	0.061
inc2	0.027	0.051
inc3	0.026	0.037
inc4	0.040	0.053
wman	0.021	0.028
wfree	0.030	0.054
wune	0.054	0.075

Note: Sample 1999m1-2010m3.

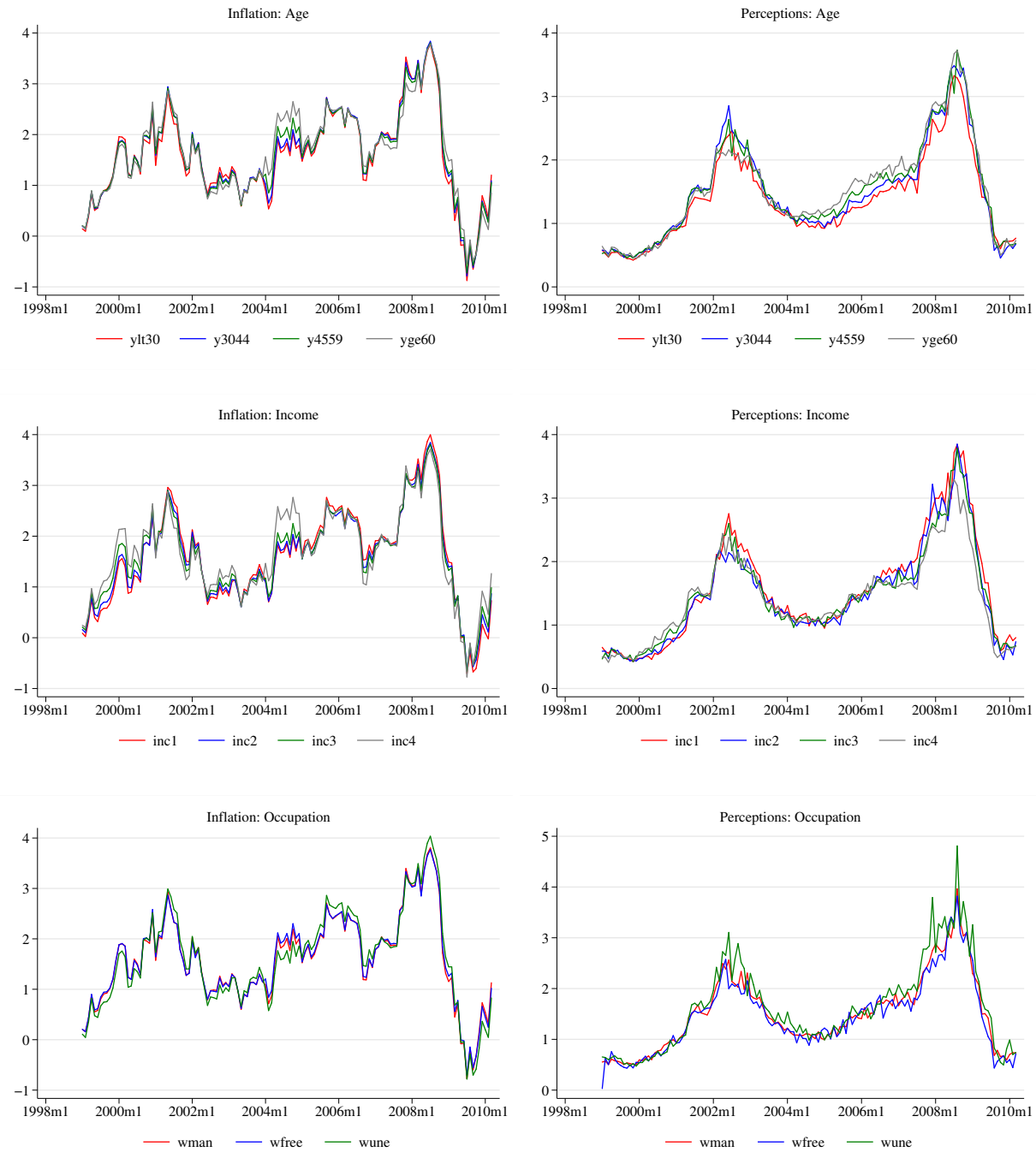
Table A.3: Studies Documenting Demographic Effects on Inflation Expectations

Paper		Bryan and Venkatu (2001b)	Leung (2009)	Brischetto and de Brouwer (1999)	Palmqvist and Strömberg (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.

Figure A.1: Household-Specific Inflation Rates and Perceptions



B GAPSQ - TESTS FOR COEFFICIENT RESTRICTIONS

Table A.4: Coefficient Test: GAPSQ, HH-Inflation and Media Index

	Age				Income				Work			
	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p
π_{t-1}	13.09	0.004	13.09	0.011	14.48	0.002	18.17	0.001	14.44	0.001	14.81	0.002
$News_t^{pr\_index}$	0.69	0.876	5.01	0.286	4.41	0.221	4.75	0.314	6.71	0.035	8.19	0.042
$News_t^{tv\_index}$	6.55	0.088	6.80	0.147	3.32	0.345	3.44	0.488	5.91	0.052	5.99	0.112
$\pi_{j,t} - \pi_t$	5.66	0.129	18.53	0.001	2.52	0.471	28.82	0.000	0.73	0.695	16.88	0.001
$perc_{j,t} - perc_t$	3.62	0.306	3.89	0.421	3.88	0.275	5.29	0.259	0.48	0.788	0.59	0.899

Note: Column (1) tests for equality, $H_0 : \alpha_{j,1} = \alpha_1$; (2) for common significance, $H_0 : \alpha_{j,1} = 0$, of SUR coefficients.

Table A.5: Coefficient Test: GAPSQ, HH-Inflation and Media Tone Index

	Age				Income				Work			
	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p
π_{t-1}	11.09	0.011	12.22	0.016	16.44	0.001	20.04	0.000	16.85	0.000	16.94	0.001
$News_t^{pos\_con}$	2.41	0.492	3.28	0.513	5.29	0.152	5.32	0.256	1.50	0.472	2.30	0.512
$News_t^{neg\_con}$	2.72	0.437	8.46	0.076	6.05	0.109	7.12	0.130	5.22	0.074	6.35	0.096
$News_t^{pos\_val}$	1.75	0.626	2.94	0.568	3.51	0.320	6.13	0.190	1.47	0.479	4.06	0.255
$News_t^{neg\_val}$	0.79	0.853	8.72	0.068	6.03	0.110	9.17	0.057	5.89	0.053	8.71	0.033
$\pi_{j,t} - \pi_t$	4.38	0.224	20.38	0.000	3.14	0.371	28.56	0.000	0.35	0.838	18.81	0.000
$perc_{j,t} - perc_t$	3.77	0.288	3.87	0.424	4.36	0.225	5.87	0.209	0.29	0.866	0.39	0.942

Note: Column (1) tests for equality, $H_0 : \alpha_{j,1} = \alpha_1$; (2) for common significance, $H_0 : \alpha_{j,1} = 0$, of SUR coefficients.

Table A.6: Coefficient Test: GAPSQ, HH-Inflation and Single News Media

	Age				Income				Work			
	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p
π_{t-1}	13.74	0.003	14.77	0.005	12.26	0.007	19.91	0.001	10.09	0.006	12.90	0.005
$News_t^{Bild}$	0.47	0.926	5.20	0.267	6.36	0.095	6.49	0.165	6.66	0.036	8.85	0.031
$News_t^{Focus}$	1.26	0.739	1.26	0.869	7.73	0.052	8.41	0.078	0.40	0.818	1.30	0.728
$News_t^{Spiegel}$	1.27	0.736	1.46	0.835	1.43	0.700	2.62	0.624	0.13	0.936	0.75	0.860
$News_t^{Tagesschau}$	1.82	0.611	8.52	0.074	6.42	0.093	10.50	0.033	10.66	0.005	15.54	0.001
$News_t^{Tagesthemen}$	2.01	0.571	2.10	0.717	10.78	0.013	12.05	0.017	1.01	0.604	1.21	0.750
$News_t^{Heute}$	1.85	0.605	2.34	0.673	2.81	0.421	3.25	0.516	8.13	0.017	8.56	0.036
$News_t^{HeuteJournal}$	2.31	0.510	3.43	0.489	3.81	0.283	3.82	0.431	4.19	0.123	7.81	0.050
$News_t^{RTL}$	1.53	0.675	2.95	0.566	0.83	0.843	3.87	0.424	8.02	0.018	14.24	0.003
$News_t^{Sat1}$	2.29	0.514	2.61	0.624	1.61	0.658	3.74	0.442	0.61	0.737	1.94	0.585
$News_t^{Pro7}$	5.66	0.130	5.66	0.226	1.53	0.675	2.38	0.667	4.46	0.108	5.29	0.152
$\pi_{j,t} - \pi_t$	6.59	0.086	20.11	0.000	3.32	0.345	28.78	0.000	0.43	0.805	14.53	0.002
$perc_{j,t} - perc_t$	4.28	0.233	5.52	0.238	6.72	0.081	10.25	0.036	0.61	0.738	0.61	0.894

Note: Column (1) tests for equality, $H_0 : \alpha_{j,1} = \alpha_1$; (2) for common significance, $H_0 : \alpha_{j,1} = 0$, of SUR coefficients.

C GAPSQHH - TESTS FOR COEFFICIENT RESTRICTIONS

Table A.7: Coefficient Test: GAPSQHH, HH-Inflation and Media Index

	Age				Income				Work			
	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p
$\pi_t^{exp,prof}$	54.43	0.000	83.35	0.000	14.89	0.002	66.79	0.000	29.23	0.000	34.15	0.000
π_{t-1}	29.49	0.000	39.54	0.000	23.52	0.000	32.34	0.000	15.07	0.001	16.32	0.001
$News_t^{pr\_index}$	0.97	0.808	3.71	0.447	5.90	0.117	7.29	0.121	0.02	0.990	9.20	0.027
$News_t^{tv\_index}$	7.21	0.066	23.98	0.000	9.81	0.020	28.12	0.000	0.79	0.673	8.69	0.034
$\pi_{j,t} - \pi_t$	3.68	0.299	4.03	0.402	1.55	0.670	1.56	0.816	1.53	0.466	8.19	0.042
$perc_{j,t} - perc_t$	93.20	0.000	136.39	0.000	43.06	0.000	237.12	0.000	0.10	0.950	41.30	0.000

Note: Column (1) tests for equality, $H_0 : \alpha_{j,1} = \alpha_1$; (2) for common significance, $H_0 : \alpha_{j,1} = 0$, of SUR coefficients.

Table A.8: Coefficient Test: GAPSQHH, HH-Inflation and Media Tone Index

	Age				Income				Work			
	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p
$\pi_t^{exp,prof}$	56.56	0.000	87.31	0.000	13.88	0.003	73.28	0.000	29.82	0.000	37.32	0.000
π_{t-1}	27.26	0.000	40.93	0.000	23.34	0.000	33.29	0.000	14.95	0.001	15.41	0.001
$News_t^{pos\_con}$	0.79	0.853	7.89	0.096	0.96	0.811	3.28	0.512	2.40	0.301	3.37	0.338
$News_t^{neg\_con}$	8.05	0.045	12.58	0.014	0.17	0.983	12.23	0.016	2.17	0.338	7.65	0.054
$News_t^{pos\_val}$	4.66	0.198	5.51	0.239	1.50	0.682	3.59	0.465	3.84	0.147	4.12	0.248
$News_t^{neg\_val}$	3.90	0.272	5.81	0.214	3.09	0.378	7.61	0.107	1.58	0.453	3.81	0.283
$\pi_{j,t} - \pi_t$	3.22	0.359	3.23	0.520	1.80	0.616	1.84	0.765	1.82	0.402	4.59	0.204
$perc_{j,t} - perc_t$	92.39	0.000	132.69	0.000	56.69	0.000	252.29	0.000	0.15	0.929	35.38	0.000

Note: Column (1) tests for equality, $H_0 : \alpha_{j,1} = \alpha_1$; (2) for common significance, $H_0 : \alpha_{j,1} = 0$, of SUR coefficients.

Table A.9: Coefficient Test: GAPSQHH, HH-Inflation and Single News Media

	Age				Income				Work			
	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p
$\pi_t^{exp,prof}$	46.88	0.000	65.39	0.000	12.48	0.006	59.95	0.000	19.78	0.000	24.19	0.000
π_{t-1}	26.34	0.000	34.16	0.000	22.30	0.000	31.26	0.000	12.68	0.002	13.11	0.004
$News_t^{Bild}$	0.56	0.905	4.77	0.311	18.55	0.000	18.83	0.001	0.79	0.673	8.20	0.042
$News_t^{Focus}$	2.83	0.418	3.42	0.490	5.05	0.168	8.14	0.087	0.05	0.974	0.08	0.994
$News_t^{Spiegel}$	1.96	0.581	1.98	0.740	0.75	0.861	0.75	0.945	0.17	0.919	0.42	0.936
$News_t^{Tagesschau}$	8.69	0.034	21.22	0.000	2.21	0.530	17.77	0.001	7.86	0.020	7.87	0.049
$News_t^{Tagesthemen}$	1.82	0.611	1.89	0.756	3.37	0.338	3.51	0.476	2.95	0.229	3.34	0.342
$News_t^{Heute}$	5.09	0.166	5.13	0.274	0.58	0.901	1.63	0.803	1.05	0.592	1.05	0.788
$News_t^{HeuteJournal}$	1.35	0.718	1.80	0.772	0.16	0.984	0.78	0.941	0.95	0.621	9.34	0.025
$News_t^{RTL}$	7.35	0.062	7.97	0.093	8.50	0.037	8.52	0.074	3.46	0.177	3.83	0.281
$News_t^{Sat1}$	8.20	0.042	9.32	0.054	6.87	0.076	10.77	0.029	4.31	0.116	4.47	0.215
$News_t^{Pro7}$	18.78	0.000	19.99	0.001	0.87	0.833	10.68	0.030	3.04	0.219	3.91	0.272
$\pi_{j,t} - \pi_t$	3.65	0.302	4.58	0.333	3.27	0.351	3.68	0.451	0.73	0.696	6.26	0.100
$perc_{j,t} - perc_t$	92.49	0.000	135.79	0.000	47.43	0.000	224.23	0.000	0.24	0.888	40.82	0.000

Note: Column (1) tests for equality, $H_0 : \alpha_{j,1} = \alpha_1$; (2) for common significance, $H_0 : \alpha_{j,1} = 0$, of SUR coefficients.

Table A.10: SUR Model: GAPSQ, COICOP - Coefficient Tests

	Age				Income				Work			
	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p
π_{t-1}	13.94	0.003	18.57	0.001	0.65	0.885	14.62	0.006	3.09	0.213	8.04	0.045
$News_t^{Bild}$	0.26	0.968	0.26	0.992	2.05	0.563	2.30	0.681	0.98	0.611	0.99	0.804
$News_t^{Focus}$	1.83	0.609	3.44	0.487	10.50	0.015	10.62	0.031	0.88	0.642	4.12	0.249
$News_t^{Spiegel}$	2.58	0.462	2.74	0.602	5.53	0.137	6.20	0.184	0.87	0.649	0.90	0.825
$News_t^{Tagesschau}$	4.00	0.261	5.40	0.249	5.18	0.159	5.38	0.250	8.57	0.014	10.45	0.015
$News_t^{Tagesthemen}$	3.53	0.316	4.47	0.346	16.06	0.001	16.31	0.003	0.29	0.867	2.08	0.557
$News_t^{Heute}$	5.75	0.125	6.05	0.196	4.66	0.199	5.05	0.282	11.22	0.004	13.91	0.003
$News_t^{HeuteJournal}$	5.14	0.162	6.59	0.159	7.39	0.061	7.39	0.117	3.98	0.137	8.00	0.046
$News_t^{RTL}$	0.90	0.825	1.02	0.907	4.67	0.198	6.22	0.183	6.35	0.042	6.43	0.092
$News_t^{Sat1}$	5.12	0.163	5.25	0.263	2.58	0.461	4.26	0.372	1.08	0.584	1.30	0.729
$News_t^{Pro7}$	6.91	0.075	7.00	0.136	2.59	0.460	3.34	0.503	9.40	0.009	10.21	0.017
Food and non-alcoholic	10.91	0.012	42.41	0.000	8.65	0.034	28.37	0.000	2.31	0.316	27.05	0.000
Clothing and footwear	14.07	0.003	14.45	0.006	1.62	0.655	2.45	0.654	0.08	0.962	0.46	0.927
Housing, electricity and fuels	19.41	0.000	19.86	0.001	8.05	0.045	8.17	0.086	0.69	0.707	1.15	0.766
Household and maintenance	4.14	0.247	5.28	0.260	1.74	0.627	4.60	0.331	2.95	0.229	5.54	0.136
Transport	1.04	0.790	20.51	0.000	26.16	0.000	26.84	0.000	9.12	0.010	24.72	0.000
Communications	0.26	0.967	27.37	0.000	26.81	0.000	32.28	0.000	7.05	0.029	30.43	0.000
Recreation and culture	14.14	0.003	17.02	0.002	6.23	0.101	6.53	0.163	7.83	0.020	9.35	0.025
Restaurants and hotels	6.98	0.073	8.33	0.080	1.39	0.708	4.25	0.373	1.36	0.507	2.59	0.460
Miscellaneous	6.20	0.102	8.31	0.081	2.70	0.441	5.79	0.215	2.36	0.307	5.40	0.145
$perc_{j,t} - perc_t$	4.77	0.190	4.80	0.309	7.61	0.055	12.81	0.012	2.28	0.320	2.82	0.420

Note: Column (1) tests for equality, $H_0 : \alpha_{j,1} = \alpha_1$; (2) for common significance, $H_0 : \alpha_{j,1} = 0$, of SUR coefficients.