Asymmetries in Inflation Expectations across Sociodemographic Groups*

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Abstract. This paper explores the connection between households' socioeconomic background and their inflation forecasts. We use data on inflation expectations from the Survey of Consumer Attitudes and Behavior, conducted at the University of Michigan. Our contribution is threefold. First, we detect important empirical regularities in the connection between consumers' sociodemographic background and their predictive accuracy. We show that part of the heterogeneity in their forecasts can be explained upon the fact that socioeconomically more disadvantaged households may consider their group-specific CPI inflation as their forecast objective, rather than being concerned with changes in the general CPI. Second, we explore the linkages between news coverage on inflation and consumers' expectations. We show that distinguishing between news available to the public and perceived news is crucial for a correct assessment of the impact of news on consumers' prediction bias. Third, we highlight important differences in the degree of information stickiness across consumers with different socioeconomic backgrounds, and show that their predictive accuracy is asymmetrically affected by favorable and unfavorable news on prices.

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Introduction

Anchored inflation expectations are a prerequisite for maintaining price stability. The effectiveness of central banking depends on how individuals perceive the course of monetary policy and future economic developments. Economists typically assume that private agents have perfect knowledge of the statistical properties of the variables they wish to forecast. However, heterogeneity is pervasive in the real world and agents do not predict on the basis of the same information set, do not entail the same capacity to process information, and do not necessarily employ the same model. At the light of these considerations, it is of crucial importance to explore and understand the roots of heterogeneity in private agents' inflation expectations.

Hicks (1939) can be regarded as one of the first economists interested in the fundamental process of inflation expectation formation:

> 'It seems possible to classify three sorts of influences to which price-expectations may be subject. One sort is entirely non-economic: the weather, the political news, people's state of health their "psychology". Another is economic, but still not closely connected with actual price movements; it will include mere market superstitions, at the one extreme, and news bearing on future movements of demand or supply (e.g., crop reports), at the other. The third consists of actual experience of prices, experience in the past and experience in the present; it is this last about what we can find most to say.' (Hicks, 1939, p. 204)

This paper deals with the socioeconomic roots of heterogeneity in consumers' inflation expectations. Agents differing in their sociodemographic characteristics entail different degrees of access to the relevant information and capacities to process information.[1] Using monthly data on households' inflation expectations from the University of Michigan Survey (MS hereafter), we assess the influence of consumers' socioeconomic background on their forecasts. We evaluate the role of information constraints and the impact of media coverage on the process of expectation formation, as well as the frequency at which consumers update their expectations.

Focusing on households' expectations is important at the light of the debate on credibility in monetary policy. Central banks' communication is crucial to attain the desired outcome. Heterogeneity in the process of expectation formation and the degree of sluggishness in the expectations of households with different socioeconomic backgrounds can have non-trivial implications for the real cost of disinflations. As a matter of fact a credible announcement is such only if it is intelligible by the vast majority of the population.[2] The present study provides

[1] Moreover, socioeconomic indicators might help at assessing the importance of the financial constraints faced by private agents. As gathering information is costly, some agents might be forced to rely on less sophisticated forecasting technologies. The literature on rationally heterogeneous expectations deals with this issue. The problem is treated from a utility-maximizing viewpoint, whereby agents choose between alternative models of expectation formation. Brock and Hommes (1997), Branch and McGough (2007) and Pfajfar (2008) analyze different switching mechanisms within a cobweb framework. In particular, Pfajfar (2008) stresses the importance of the capacity to process information.

[2] Carroll (2003a) suggests that there are large gaps between households' beliefs and those of the professional forecasters. Therefore, policy prescriptions based on traditional empirical tests aimed at assessing monetary authorities' credibility among experts might by severely biased.

an insight into this area and delivers some important results for the design of central banks' communication strategies.

We start by showing that consumers' income level, educational attainment and gender are important determinants of their predictive accuracy. The sum of squared errors computed from the bias between CPI inflation and the forecasts of wealthier, more educated, and male participants is on average smaller than that obtained for other classes of consumers. However, as the representative consumption basket can vary significantly across agents with different socioeconomic characteristics, we account for the possibility that households might aim at forecasting the rate of inflation computed from their group-specific consumption basket. Relying on the Consumer Expenditure Survey and on item-specific CPI data provided by McGranahan and Paulson (2005) we show that socioeconomically less advantaged individuals are likely to forecast inflation by assuming as a reference point the price index of their group-specific consumption basket. By contrast, more advantaged classes of agents are less concerned with the rate of inflation computed from their group-specific CPI, and seem to take into consideration changes in the general CPI. Even though group-specific inflation cannot entirely explain the discrepancies in the degree of prediction accuracy across various demographic groups, this is proven to be quite important, especially for the least economically advantaged interviewees.

We then explore the connection between private agents' receptiveness to news about inflation and the accuracy of their inflation forecasts. On average, only 5.2% of the households in the sample have heard news about prices in the past month, a value much lower than that implied by other indicators of the volume of information available in the economy, such as news coverage or actual inflation. We argue that previous studies based on these proxies may over-estimate the information available to households. By contrast, we employ a direct measure of the information which is actually perceived by households. We also show that the level of favorable news on prices constantly lies below that of unfavorable ones. On the one hand, the fraction of respondents hearing unfavorable news is by far more volatile, peaking when inflation rises suddenly. On the other hand, the percentage of agents hearing favorable news is negatively (but weakly) correlated with positive changes in inflation. This hints that consumers entail higher receptiveness to news about inflation mostly during adverse periods. Otherwise, general or specialized news coverage is somewhat disregarded during periods of stable and low inflation. Significant differences emerge when conditioning consumers' responses to their socioeconomic characteristics. The average perception of news about prices increases in the level of socioeconomic advantage. These findings emphasize the need to design more efficient communication strategies, capable to enhance stronger receptiveness to the relevant information by the private sector as a whole.

We finally focus on the role played by consumers' socioeconomic background in shaping the relationship between news coverage on inflation and the frequency at which they update their expectations. We employ the epidemiological framework put forward by Carroll (2003a, 2003b), which assumes that consumers update their inflation expectations from news reports influenced by the views of professional forecasters. An important implication of this theory is that greater news coverage should be associated with "more rational" household forecasts, so

that these are closer to those of the professional forecasters. This implies that rising inflationary pressures, which are usually accompanied by greater news coverage, should be associated with a higher frequency of information updating. We compare the updating frequency retrieved from the estimation of the epidemiological model over two samples characterized by marked differences in inflation dynamics (pre- and post-1988). A statistically significant difference in the estimated frequency of updating is highlighted only for the least socioeconomically advantaged participants. Moreover, we regress the bias between households' and professional forecasters' predictions on the fraction of agents that have perceived favorable and unfavorable news about prices in the past month. We show that unfavorable news contribute to widen the bias, while favorable news help at narrowing it down. Most importantly, while the absolute impact of favorable news decreases in the degree of socioeconomic advantage, negative news are more effective in widening the gap as the degree of socioeconomic advantage increases.

Only few studies have considered the role of socioeconomic factors in the process of inflation expectations formation. Jonung (1981) shows that female inflation forecasts are less accurate than those of their male counterparts (see also Bryan and Venkatu, 2001a, 2001b). As women are usually responsible for day-to-day food purchasing, Jonung (1981) suggests that this bias is due to relatively larger rises in food prices compared to those experienced by the general CPI. To the best of our knowledge, three other studies have partly focused on the relationship between the predictive accuracy of survey inflation expectations and consumers' socioeconomic background. Maital and Maital (1981) implement some tests for rationality, both on individual and group-specific expectations on the average level of inflation.[3] They conclude that socioeconomic variables such as age, trust and income exert a strong influence on the expectation formation process. Palmqvist and Strömberg (2004) show that inflation opinions in Sweden are lower among male, more educated and wealthier respondents. Lindén (2004) reaches analogous conclusions when comparing perceived and expected inflation in the Euro area.

The remainder of the paper is laid out as follows. Section 1 describes the Michigan Survey data and reports some preliminary descriptive statistics. Section 2 explores the importance of group-specific CPI inflation for the forecast accuracy of agents with different socioeconomic backgrounds. Section 3 focuses on the impact of news about prices on survey inflation expectations. In Section 4 we estimate the relative speed of information updating conditional on the demographic background of the MS respondents. We also estimate some more general models of expectation formation designed to explore to which extent agents exploit the relevant macroeconomic statistics when forecasting inflation. The last section concludes.

1. The Survey of Consumer Attitudes and Behavior

The Survey of Consumer Attitudes and Behavior, conducted by the Survey Research Center (SRC) at the University of Michigan, has been available on a monthly basis since January 1978. The survey comprises a cross-section of about 500 households per month.[4] After a first

[3] Expectations from different socioeconomic groups are obtained from the Current Survey of the Israel Institute for Applied Social Research.

[4] A peak of 1,479 households occurs in November 1978 and a minimum of 492 in November 1992. An average of approximately 500 respondents per month are sampled since January 1987.

interview, each respondent is re-interviewed after six months. The sampling method is designed in such a way that approximately 45% of prior respondents are re-interviewed in every round, while the remaining 55% are new households. There are two relevant questions about expected price level changes: (i) firstly, households are asked whether they expect prices to go up, down or to stay the same in the next 12 months; (ii) secondly, they are asked to provide a quantitative answer about the expected change.[5] Our analysis is almost exclusively focused on measures of central tendency, i.e. the mean and the median inflation forecast. We regard the latter as a more reliable proxy for households' forecasts, in consideration of the marked degree of skewness in the MS distribution of inflation expectations. As to the data on agents' perception of news on prices, we consider the number of MS respondents that have heard "news of recent changes in business conditions". Specifically, we retrieve the proportion of households that have heard favorable and unfavorable news on prices in the month before the interview.

We condition consumers' responses on their gender, income level (lowest tercile [Y13], middle tercile [Y23] and top tercile [Y33]), educational attainment (high school or less [EHS], some college degree [ESC] and college degree [ECD]), age (between 18-34, 35-54, and 55+) and location (east [E], south [S], north west [NW] and north center [NC] of the US).

We consider data over the time window 1978:01-2005:02. Figure 1(a) plots the mean and the median forecast from the overall sample against CPI inflation.[6] Both statistics underestimate the rising inflationary pressures in the first part of the sample, although the forecasting performance improves remarkably during the subsequent disinflation. This improvement is probably due to the credibility that the Federal Reserve has acquired in fighting inflationary pressures. In the post-1988 subsample expectations appear to be quite stable, although they almost systematically fail to match periods of low inflation.

Insert Figures 1(a)-(b) here.
Insert Tables 2(a)-(c) here.

Table 1 reports the time average of the empirical moments of the MS distribution together with the average CPI inflation. The mean forecast of male, top income level, highly educated, and elderly individuals is lower than that of other respondents in the sample. This is in line with the evidence reported by Palmqvist and Strömberg (2004) and Lindén (2004) for Sweden and Euro area, respectively. As to the median, lower values are associated with elderly and wealthier respondents, while higher values correspond to young and female interviewees. The analysis of the empirical variance reveals that highly educated and wealthy participants provide less volatile predictions with respect to other groups of consumers. Overall, our evidence confirms the conclusions of Fishe and Idson (1990), as the degree of dispersion in inflation forecasts is lower for agents with potentially greater demand for information.

In Table 2(a) we compare the mean and median of the MS distribution in terms of their prediction accuracy. We report the sum of squared errors (SSE) for each measure of central

[5] If prices are expected to stay the same, the interviewer must make sure that the respondent does not actually have in mind a change in the price level which is the same as that measured at the time of the interview.

[6] All the series describing expectational variables are plotted with a one-year time lag, so as to enhance comparability with the forecast target.

tendency.[7] On average, the median forecast tracks actual inflation more closely than the mean.[8] Importantly, the bias decreases in the income level of the MS respondents, as well as in their educational attainment. This pattern is robust over time, as shown in Tables 2(b) and 2(c), where we report the descriptive statistics for two sub-samples (1978:01-1988:12 and 1989:01-2005:12) that allow us to take into adequate account the period of high inflation at the beginning of the sample and the subsequent disinflation [see also Figure 1(a)].

Insert Tables 2(a)-(c) here.

2. Group-Specific Inflation and Predictive Accuracy

Although the objective of the MS is to collect participants' forecasts about changes in the general price level, we believe that some groups may produce responses based on their own experience. These consumers do not necessarily aim at forecasting the general CPI inflation, but may take into account changes in their group-specific CPI. This factor is likely to gain further importance in periods of stable inflation, during which agents update their information set less frequently and/or are less concerned with inflation dynamics. In such circumstances agents generally rely on their own experience to produce inflation forecasts.[9] This part of the analysis is aimed at evaluating the predictive accuracy of different socioeconomic groups of households, by comparing their responses to both group-specific and overall CPI inflation.

Bryan and Venkatu (2001a) argue that some agents may consider group-specific inflation as a benchmark for their forecasts, and suggest this is an important factor in explaining the marked heterogeneity in households' inflation expectations. Socioeconomic characteristics determining the composition of the consumption basket are likely to exert a substantial effect on the perception of inflation for individuals with different characteristics. Overall, it is well documented that different socioeconomic groups face different rates of inflation. On average, low income, poorly educated, and elderly agents are generally exposed to higher than average inflation rates. This finding was first pointed out in Michael (1979) and Hagemann (1982).

Relying on the Consumer Expenditure Survey and on item-specific CPI data, McGranahan and Paulson (2005) calculate monthly chain-weighted inflation measures for thirteen different demographic groups and for the overall urban population, from 1981 to 2004. They show that inflation experiences of different groups are highly correlated with (and similar in magnitude to) those of the overall urban population. Nevertheless, the inflation rate borne by the elderly population is generally higher than that experienced by the overall urban population. Furthermore, inflation volatility is higher for relatively less advantaged groups of respondents (e.g. elderly, less educated, bottom income level) and lower for the most advantaged ones. We argue that this

[7] The classification based on the income level has only started in October 1979. To enhance comparability across groups, we adjust the index for an average error, so as to account for the time gap. We must bear in mind that, as inflation is higher and more volatile in the first part of the sample, forecast errors are on average higher in this phase.

[8] Nonetheless, the mean is a better predictor than the median in the period of high inflation.

[9] McGranahan and Toussaint-Comeau (2006) suggest that consumers' sentiment is based on both individual experiences and exposure to news. They show that a substantial fraction of agents in the sample report having heard no news, and infer that these must be considerably dependent on their own experience and perceptions.

effect might result from higher expenditure shares on necessities among less educated agents. In fact, prices of these goods are generally more volatile, especially when food and energy are considered.[10]

Part of the data provided by McGranahan and Paulson (2005) are not compatible with the MS data on households' expectations, as a different classification is followed in the sampling procedure. To overcome this problem some adjustment is necessary. McGranahan and Paulson (2005) only consider two age categories: elderly and not elderly. In their classification, consumers older than 65 are regarded as elderly. To retrieve an indicator for 55+ CPI inflation, we compute a weighted average of the series for the group-specific inflation of elderly and not elderly respondents. Weights are computed by retrieving the share of respondents in the [55, 64] age interval and that of the 65+ respondents in the overall population. Data on the US demographic structure are obtained from the US Census.[11]

Table 3 reports the time-average of the mean and median predictor, together with the time-average of the CPI inflation rate for each demographic group. We also report the SSE for both predictors with respect to general CPI inflation (SSE_{mean}, SSE_{median}) and to the group-specific CPI inflations (SSE^*_{mean}, SSE^*_{median}).

Insert Table 3 here.

Both SSE^*_{median} and SSE_{median} decline in the level of economic advantage. Most importantly, $SSE^*_{median} < SSE_{median}$ for the bottom and middle income group, while the inequality is reversed for the top income group. This signals that wealthy agents might actually be concerned with changes in the general CPI when forecasting inflation, whereas less economically advantaged respondents display more accurate forecasts when these are compared to their group-specific benchmark. When the MS participants are classified depending on their educational attainment the evaluation of the mean predictor delivers results similar to those obtained for the income classification. Conversely, SSE^*_{median} is always greater than SSE_{median}.

A separate digression is in order for the 55+ group. On average, elderly respondents produce more accurate median forecasts if these are compared to changes in the general CPI. However, this evidence is reversed when assessing the predictive accuracy of the mean predictor. Overall, the mean forecast of this group is the least biased if we assume that elderly agents aim at forecasting their group-specific CPI inflation. This is in line with the results obtained by McGranahan and Paulson (2005), who find that the eldest group is also the one with the largest deviation of group-specific inflation from the general one, as their cumulative inflation is on average 5% higher than current inflation. Moreover, Hobijn and Lagakos (2005) estimate that inflation as measured by the index for the elderly has been consistently higher than inflation

[10] However, this difference in variability is fairly modest. It is found that households with the lowest level of educational attainment are exposed to a rate of inflation which is about 3.0% more volatile than that experienced by the rest of all urban households.

[11] We follow a similar approach to retrieve the price indices consistent with the inflation expectations of the MS interviewees classified depending on their income level. McGranahan and Paulson (2005) compute these series for each quartile in the per-capita income distribution. Relying on the evolution of the per-capita income over the period 1981-2004 and on the contribution brought by each quartile in the income tercile, we are able to determine the weights necessary to compute the price indices for top, middle, and bottom income level individuals.

as measured by the index for wage earners, with a 0.38% annual average difference since 1984. They suggest that much of this wedge can be attributed to medical care, which constitutes a much larger share of total expenditures for the typical senior.

Generally speaking, our results point out that socioeconomically less advantaged individuals are likely to forecast inflation by assuming as a reference point their group-specific consumption basket. Conversely, more advantaged classes are less concerned with changes in the price index of their group-specific consumption basket, while they seem to consider changes in the general CPI.[12] Therefore, as the MS participants are asked to forecast changes in the general price index, it appears that these consumers address the question properly. Even though group-specific inflation cannot entirely explain the demographic discrepancies in the degree of predictive accuracy, this is rather important, at least for the least economically advantaged respondents. In the remainder of this study we explore in further detail the socioeconomic asymmetries characterizing the process of expectation formation. Particular emphasis will be posed on the relationship between news on inflation and consumers' degree of information stickiness.

3. Consumers' Sociodemographic Background and News about Prices

We now focus on the connection between news on prices and private agents' inflation forecasts. Doms and Morin (2004)[13] suggest that media coverage is important in that it affects the likelihood that consumers update their expectations. We argue that households' receptiveness to media coverage about inflation are crucial determinants of the observed asymmetries in the expectation formation process of different demographic groups. Most importantly, we suggest that explicit (self-reported) measures of agents' perception of news about prices, such as those available in the MS, are more effective to assess the impact of news on inflation forecasts than proxies based on the volume of news available in the media, which have been extensively employed in the past.

The participants to the Survey of Consumer Attitudes and Behavior report whether they have heard of favorable or unfavorable changes in the business conditions over the past month. Information on the number of agents that have heard news about prices is also available. This data represent a direct measure of the (monthly) fraction of agents that update their information set to forecast inflation.

Figure 2(a) reports the fraction of MS respondents that have heard favorable and unfavorable

[12] A related issue is whether the group-specific CPI inflation matches individuals' perceived inflation. Indeed, agents' forecasts are generally based on their perceived rate of inflation. To account for this effect, we should compare the forecast bias with respect to both group-specific and perceived inflation. Unfortunately, the MS does not contain this additional information, although some surveys ask their interviewees to state the actual inflation they perceive, along with their inflation forecasts. The survey designed by the European Commision is an example (see, e.g., Lindén, 2004). In general, differences between perceived and actual inflation are much higher than those between group-specific and actual inflation. We can argue that the bias between group-specific inflation and actual inflation does not account for the entire bias that is generally observed between perceived an actual inflation, albeit it is quite important for less socioeconomically advantaged survey participants.

[13] They explore the impact of news media on consumers' perceptions of the economy. Three channels of influence are highlighted. First, the news media convey the latest economic data and the opinions of professionals to consumers. Second, consumers receive a signal about the economy through the tone and volume of economic reporting. Last, the greater the volume of news about the economy, the greater the likelihood that consumers update their expectations about the economy.

news about prices in the past month, together with the volume of news released by the media (from 1978 up to 2001) and actual inflation. The "volume" indicator is based on the intensity of news coverage on inflation elaborated by Carroll (2003a). This is based on the number of articles on the front page of the New York Times and the Washington Post containing words with the root "inflation". The accuracy of this proxy is questionable on different grounds. For instance, Blinder and Krueger (2004) argue that most of the information on inflation comes from the television, followed by local (rather than national) newspapers. Most importantly, as we will discuss in further detail, the volume of articles on inflation does not match the actual amount of information assimilated by the public. This is the result of two mutually reinforcing effects: (i) news in the media do not necessarily reach the public uniformly and (ii) the impact of news on inflation expectations is likely to be affected by consumers' sociodemographic background, which is connected with their capacity to process the information embodied in these news.

The total fraction of agents that have heard news about prices in the past month tracks inflation dynamics quite closely. Moreover, sudden shifts in the fraction of agents perceiving news on prices occur when inflation abruptly changes, especially to higher values. By contrast, the volume indicator is less affected by movements in the rate of inflation.

Insert Figures 2(a)-(c) here.

Do consumers have different perceptions of the news they hear? It can be readily noticed that the level of favorable news lies almost constantly below that of unfavorable ones. The fraction of respondents hearing unfavorable news is by far more volatile, displaying a number of peaks when inflation suddenly accelerates. As expected, the percentage of agents hearing favorable news is negatively (but weakly) correlated with positive changes in inflation. The sign of this correlation is reversed when considering the fraction of respondents that have heard bad news, which indicates that consumers pay attention to news about inflation mostly during adverse periods, generally characterized by high and volatile inflation. Conversely, media coverage is somewhat disregarded in times of stable and low inflation. According to Hamilton (2004), a common finding in literature on news coverage is that there is more reporting of bad news than good ones. This asymmetry is in line with the prospect theory pioneered by Kahneman and Tversky (1979), as agents manifest higher receptiveness towards bad news on prices compared to good news.

Figures 2(b) and 2(c) report the average and variance of the fraction of MS interviewees that have heard news about prices in the past month. On average, only 5.2% of the interviewees report having heard news about prices in each month. As we regard these data as an explicit indicator of consumers' perception of news about prices, it is important to notice that this value is much lower than the one implied by indirect measures employed in previous studies, such as news coverage (proxied by the number of articles on inflation in newspapers) or actual inflation. Therefore, empirical studies employing indirect indicators of the news available in the economy may over-estimate the information set available to households.

Significant differences emerge when conditioning agents' responses to their socioeconomic background. Both the average and variance of the fraction of households that have heard

news about prices increase in the level of socioeconomic advantage. Also male respondents display higher average receptiveness than women. A possible explanation for this evidence is that women typically read newspapers less often than men.[14] As to the role of income and education, it is natural to expect that, on average, a higher proportion of wealthy or well educated agents hear news about prices, compared to socioeconomically more disadvantaged respondents. Curtin (2005) suggests that less advantaged groups face higher costs of collecting and processing information, thus displaying a lower frequency of information updating and greater heterogeneity in their forecasts.

4. News and Expectations Updating

In this section we explore the connection between agents' sociodemographic background and their frequency of information updating. Carroll (2003a, 2003b) has put forward an econometric setting based on a probabilistic updating mechanism. He designs an epidemiological framework, whereby households update their information set from news reports, which are influenced by the expectations of the professional forecasters.[15] His analysis on MS consumers' forecasts reports evidence of a rather slow diffusion process, with about 27% of the agents updating their forecasts in every quarter.[16] According to this view the MS data presented in the previous section reflect a much higher degree of stickiness in expectations updating, as an average of only 5.2% of the interviewees have heard news about prices in the last 30 days.

We start by estimating a simple regression in the vein of Carroll (2003a), one for each demographic sub-group. The key assumption is that news about inflation spread slowly across agents, reaching only a fraction λ of the population in each period:

$$\pi_{t|t-12} = \lambda \pi^{F}_{t|t-12} + (1-\lambda)\, \pi_{t-1|t-13} + \varepsilon_t. \tag{1}$$

where $\pi^{F}_{t|t-12}$ denotes the one-year-ahead median inflation forecast from the Survey of Professional Forecasters (SPF), $\pi_{t|t-12}$ is the MS median inflation forecast at time $t-12$ for period t and ε_t is a $N(0,1)$ disturbance.[17]

Insert Table 4 here

[14] A number of polls indicate that whereas men read more newspapers, women are more involved in reading books. In the case of print media, about 45% of men and 40% of women report reading a newspaper daily (Bimber, 2000). "Reading in the US can be described to some extent as determined by one's lifestyle: a higher income, a good education, being male and of an age indicating a state in life that may be called 'established' (Schoenbach, Lauf, McLeod, and Scheufele, 1999, p. 237)."

[15] Mankiw and Reis (2002) envisage a similar framework. They assume that agents update their forecasts only occasionally due to the presence of a cost of obtaining and processing information.

[16] Doepke, Dovern, Fritsche, and Slacalek (2008) estimate Carroll's sticky information model of inflation expectations for Italy, Germany, the UK, and France. They propose two alternative parameterizations of the sticky information model that differ in the stationarity assumptions about the underlying series. The implied information updating for the European households is roughly once in 18 months in the stationary case, whereas the VECM implies that households update information about once a year. Easaw and Ghoshray (2006) envisage a Lucas' island model where agents update their real (or relative) income forecasts from professional forecasts. However, these forecasts are imperfectly observed and consequently expectations are only partially adjusted, thus giving rise to real effects and persistence in the aggregate economy.

[17] We consider both the median and the mean forecast. As the results are similar, we only report those for the median.

Table 4 reports $\hat{\lambda}$ for each demographic group: as remarked above, this coefficient has to be interpreted as the average fraction of agents that update their forecast in a given month, while its inverse is the estimated frequency of expectation updating from professional forecasters' expectations on one-year-ahead inflation. An average of 20% of the households update their expectations in every period. Important differences emerge when considering the group-specific frequency of expectation updating. On average, male respondents update their information set more frequently than women. As to the connection between age and information stickiness, $\hat{\lambda}$ does not vary much over the age spectrum. We are presented with a different picture when conditioning households' forecast on their income and educational attainment. Surprisingly, households in the middle income group appear to update their forecasts more frequently than other respondents: a U-shaped pattern emerges over the income range, with poorer agents displaying the highest degree of stickiness in the updating process. Also agents with some college degree update their expectations more frequently than respondents with a lower or higher educational attainment. These results contrast with the data reported above, which suggest that the average receptiveness to news from the media increases in income and educational attainment. However, the adjusted R^2 from the least squares regression of model (1) is generally higher for socioeconomically more advantaged and male respondents.

We test another implication of the theoretical apparatus formalized by Carroll (2003a). An important element of this theory is that greater news coverage is associated with "more rational" household forecasts, in the sense that these are closer to those of the professional forecasters. This implies that rising inflation, which is usually accompanied by greater news coverage,[18] should be associated with a higher frequency of information updating. One obvious justification is that the cost of acquiring information about the economy is likely to be lower when news coverage is high. Also the psychological literature has recognized that information updating does not take place at a constant pace. As discussed by Epley and Gilovich (2006) adjusting to the arrival of new information may be slower if the adjustment entails significant costs in terms of processing information and because people prefer to make decisions cautiously (i.e. making small adjustments in each period) and not erratically. All else equal, lower costs will increase how frequently people sample information. We split the sample so as to distinguish between the period of high inflation (pre-1988) and that characterized by stable price dynamics (post-1988). The Wald statistics reported in the last column of Table 5 deliver some mixed evidence, as the coefficient estimates do not display any statistically significant difference across the two samples for socioeconomically more advantaged and elderly respondents. However, for the other groups a significantly higher updating frequency can be appreciated during the first part of the sample.

These results warrant a deeper investigation on the impact of news on consumers' expectations. However, some preliminary considerations are in order: (i) a first point is that media coverage may induce some bias when reporting the views of professional forecasters: in turn,

[18] This view is also supported by the data on news perceived by the MS interviewees, which are reported in the previous section. It is also supported by Carroll (2003a), who employs the rate of inflation as a proxy for news coverage on inflation.

this bias should automatically reflect into households' views, in the logic of the model put forward by Carroll (2003a); (ii) second, as shown by a number of contributions, the expectations of the professional forecasters are not entirely rational;[19] (iii) third, news in the media are not uniformly perceived by the public, as suggested by the discrepancy between the results retrieved from (1) and the data reported in the previous section. Therefore, distinguishing between available and perceived news is crucial for a reliable assessment of the relationship between news and consumers' predictive accuracy.

Carroll (2003a) has proposed a formal procedure to test whether greater news coverage is associated with less biased household forecasts.[20] This consists of a regression of the square of the distance between the MS and SPF forecasts, $GAP_{t|t-12} = \left(\pi_{t|t-12} - \pi^F_{t|t-12}\right)^2$, on the rate of inflation. The latter is taken as a proxy for the amount of news available in the economy:

$$GAP_{t|t-12} = \gamma_0 + \gamma_1 NEWS_{t-12}. \tag{2}$$

A negative γ_1 implies that an increase in the volume of news induces an alignment of consumers' expectations to the "rational" benchmark, the SPF median forecast. Instead of proxying $NEWS$ with the rate of inflation or the "volume" indicator, which merely indicates the amount of publicly available news, we use the fraction of MS respondents that have heard news about prices in the past month. For the reasons exposed above, this has to be interpreted as an explicit indicator of the actual amount of news assimilated by the MS participants. Table 5 reports the coefficient estimates of equation (2).[21] The GAP index proposed by Carroll is computed as the square of the distance between households' and professional forecasters' predictions. This indicator does not consider that professional forecasts might be also partly biased, as discussed above. Consequently, we also employ an alternative GAP measure, which explicitly accounts for the forecast errors of both households and professional forecasters:

$$GAP^*_{t|t-12} = \left| \left(\pi_{t|t-12} - \pi_t\right)^2 - \left(\pi^F_{t|t-12} - \pi_t\right)^2 \right|. \tag{3}$$

Interestingly, we detect a positive and statistically significant relationship for most of the demographic groups,[22] hinting that an increase in the volume of news increases the bias between their forecasts and those of the professional forecasters. These results hold for both $GAP_{t|t-12}$ and $GAP^*_{t|t-12}$ and are robust to various dynamic specifications.

Insert Table 5 here

Our results stand in contrast to the evidence produced by Carroll (2003a), who concludes

[19] See, for instance, Roberts (1997) and Nunes (2009). Several studies have documented the presence of herding behavior in the predictions of professional forecasters. Scharfstein and Stein (1990), Banerjee (1992) and Zwiebel (1995) argue that forecasters are occasionally afraid to deviate from the majority or consensus opinion. Pons-Novell (2003) provide empirical evidence on this.

[20] Lamla and Lein (2008) have applied analogous techniques to assess the impact of the volume and of the tone channel on households' forecast accuracy.

[21] Notice that $NEWS$ reflects the amount of news heard in the last 30 days. This implicitly allows us to avoid the impact of reverse causation.

[22] And for the overall sample of respondents.

that an increase in the volume of news coverage helps at reducing the bias. However, as our indicator of perceived news is to a large extent composed by bad news about prices, it seems important to disentangle the impact of unfavorable news from that of favorable ones, so as to understand whether these have competing effects on the GAP.

We run the following regressions:

$$\begin{aligned} GAP_{t|t-12} &= \gamma_0^i + \gamma_1^i \mathbb{I} NEWS_{t-12}^i + \gamma_2^i (1 - \mathbb{I}) NEWS_{t-12}^i + \varepsilon_t^i, \\ i &= \{\text{FAVORABLE, UNFAVORABLE}\} \end{aligned}$$

where ε_t^i is a $N(0,1)$ disturbance and $\mathbb{I}$ is an indicator function, whose value equals 1 when $|\pi_t - \bar{\pi}| \leq |\pi_{t-1} - \bar{\pi}|$ and 0 otherwise, while $\bar{\pi}$ denotes the average rate of inflation over the time window considered. We introduce the indicator function to control for the potential asymmetric impact of positive and negative developments in inflation dynamics, which are assumed to depend on the distance between the rate of inflation and an implicit "perceived" target.

Table 6 reports the results from these regressions. If we simply consider the absolute impact of favorable and unfavorable news on the bias, it is evident how the latter on average widens the gap, whereas the former narrows it down. Moreover, whereas the absolute value of the impact of favorable news decreases in the degree of socioeconomic advantage and the age of the MS interviewees, negative news are more effective in widening the gap as the degree of socioeconomic advantage and/or age increase. As to the gender comparison, the absolute value of the marginal effect of favorable news is greater for female respondents compared to male ones, while the opposite holds true in the case of unfavorable news.

We also control for the effects brought by negative and positive developments in inflation dynamics. Within this setting, favorable news still exert a negative impact but, as expected on a priori grounds, their efficacy to restrict the gap is greater during positive developments. This hints that a reduction in the distance between inflation and its implicit target, combined with perceiving positive news about prices, should help at reducing the bias by more than in situations where favorable news are not supported by favorable economic developments. In the latter scenario the estimated impact is still beneficial but less pronounced. Opposite effects can be appreciated when considering the role of unfavorable news.

Insert Table 6 here

4.1. Discussion. The approach put forward by Carroll imposes a rather rigid structure on how consumers form expectations. A crucial assumption is that expectations are updated from news reports influenced by the views of professional forecasters. However, households might resort to other sources of information, or might even rely on their own experience to forecast inflation. Therefore, using only the SPF median forecast as the reference term for expectations updating may entail a non-negligible loss of information. To account for this issue we propose some econometric exercises that allow us to estimate the proportion of variation in the MS inflation forecasts (and in their bias) that can be ascribed to different drivers of households' expectations.

The first model is designed to assess the impact of different macroeconomic statistics on consumers' expectations. We consider the following regression:

$$\begin{aligned} \pi_{t|t-12} &= \alpha + \sum_i \gamma_i^x x_{t-i} + \mu \pi_{t-1|t-13} + \delta \pi^F_{t|t-12} + \varepsilon_t, \\ x_t &= \begin{bmatrix} y_t & \pi_t & i_t & r_t \end{bmatrix}' \quad i = 12, 14, 24, 30. \end{aligned} \tag{4}$$

where y_t denotes the cycle indicator (detrended industrial production index [IPI]), π_t is actual inflation, i_t is the real short term interest rate (3 months t-bill coupon rate), r_t is the long term interest rate (10 years t-bond yield).

We then ask whether the MS respondents incorporate the relevant macroeconomic information in their forecasts. Model (5) should help at unveiling the nature of the forecast error.

$$\begin{aligned} \pi_t - \pi_{t|t-12} &= \alpha + \beta \left(\pi_{t-13} - \pi_{t-13|t-25} \right) + \delta(\pi_t - \pi^F_{t|t-12}) + \phi \Delta NEWS_t + \gamma \Delta x_{t-12} + \varepsilon_t, \\ x_t &= \begin{bmatrix} y_t & \pi_t & i_t - r_t \end{bmatrix}'. \end{aligned} \tag{5}$$

Mankiw, Reis, and Wolfers (2004) and in Ball and Croushore (2003) estimate a model similar to (5) to ask whether inflation expectations take sufficient account of the publicly available information. However, Mankiw, Reis, and Wolfers (2004) regress the forecast error on the levels of some of the variables we introduce in the set of regressors, whereas our model features past errors and changes in the relevant variables as determinants of the dependent variable. Evidence of serial correlation in the forecast error indicates that there is an inefficient exploitation of information from the last year's forecast, which violates the rational expectations hypothesis (REH). Tables 7 and 8 report the results form the least squares regression of (4) and (5), respectively.

A first element to point out from both regressions is that the fit of these models tends to increase in the level of socioeconomic advantage. The variation in households' expectations is almost exclusively captured by including in the regressors the current rate of inflation, a lag of the dependent variable, and the SPF median forecast. Therefore, an information structure similar to that postulated by Carroll emerges from the estimation of (4). As to the forecast error, model (5) suggests that the variability of consumers' bias is almost exclusively captured by the bias of the SPF median forecast and by changes in the contemporaneous rate of inflation. The partial R^2 associated with $(\pi_t - \pi^F_{t|t-12})$ increases sensibly in the level of socioeconomic advantage, thus indicating that more educated and wealthier respondents' forecast errors are "more in line" with those of the professional forecasters.

Insert Tables 7 and 8 here

The results from the estimation of these models are discussed in further detail in the remainder of this section. We also summarize the most important results in terms of consumers'

expectations updating and, at the light of these findings, we advance some explanations for the heterogeneity characterizing their forecasts.

Gender. Model (5) provides a better fit for the median forecast of female respondents ($R^2 = 0.78$), compared to that of their male counterparts ($R^2 = 0.72$). On average, a higher proportion in the variation of the forecast error of female respondents can be captured by the bias in the SPF median forecast. Conversely, changes in the rate of inflation help at capturing a higher proportion in the bias variation of the male forecasters. There are considerable differences in the forecasting performance of men and women. Some explanations for this evidence have been advanced in the past. Jonung (1981) suggests that differences in the expenditure habits of men and women are at the root of the observed discrepancies. Specifically, women are usually responsible for day-to-day shopping connected with households' consumption. As such, they should entail a high degree of awareness about changes in the price of necessity goods, and their forecasts should be inevitably influenced by this factor. Over the time window observed by Jonung the bias in female forecasts can be explained upon the fact that the Food and Beverage component of the CPI has been rising faster than the general CPI, especially in the early 80s. Therefore, the role of the perceived rate of inflation may be crucial to this argument. However, this explanation finds little support in our data. We do find that the SSE_{median} of the female median forecast relative to the rate of inflation of the Food and Beverage component of the CPI is lower than that computed with respect to the general CPI. However, this is also the case also for male participants. Another possible explanation of the discrepancy between male and female forecasts relies on the fact that women generally read newspapers less often than men. Compared to the previous explanation, this point finds strong support in Section 3, where we have shown that the proportion of female respondents reporting to have heard news about prices in the previous month is much lower than the male one. Moreover, the estimation of the sticky information model (1) supports the view that the female median forecast is rather sticky ($\hat{\lambda}^{Female} = 0.111$).

Age. As to the relationship between age and consumers' inflation forecasting, the estimation of (4) shows that the partial R^2 associated with the SPF median forecast decreases in the age of the MS respondents. A similar pattern can be detected from the estimation of (5). The variation in the forecast bias of agents in the 55+ range is broadly accounted for by the bias in the SPF median forecast and, most importantly, by including a lagged term of the dependent variable. Conversely, the SPF median forecast accounts for most of the variation in the forecast error of consumers in other age intervals. What strikes about elderly respondents is that the proportion of them reporting to have heard news about prices in the past month is, on average, very low. This indicates that they mostly rely on past experience in producing inflation forecasts, as partially confirmed by our regression analysis. This evidence could be explained by appealing to the fact that since 1972 public US pensions are anchored to the price level through an indexation mechanism.[23] As indicated by Summers (1983), a major virtue of

[23] Subsequenly a number of corrections have been operated, mainly aimed at increasing the frequency of adjustment.

this system is to provide an asset with a fixed real rate of return, so that the beneficiaries are insured against the effects of inflation. Thus, elderly respondents' real income is almost insulated by price changes and this could induce them to disregard inflation dynamics and related information.

Location. Previous empirical studies on the determinants of inflation expectations have posed little or no attention on the influence of agents' geographic location on their inflation forecasts. One of the possible objections to this view arises from the possibility that individuals heavily rely on their own experience when forecasting inflation. Dunn and Mirzaie (2006) use an index of manufacturing employment concentration to proxy agents' private information. They rely on this measure to explain regional variations in consumers' confidence. Their analysis is based on the conjecture that information about a particular manufacturing sector may be better known to the employees of that sector. Therefore, layoffs in a particular industry may be more visible and generate stronger influence on the local population. These households may perceive an earlier or even a different signal of change to assess future economic trends. Interestingly, we find that agents living in the NE of the US update their information set more regularly, compared to people living in the rest of the country. This evidence provides some empirical support to the thesis advanced by Dunn and Mirzaie (2006). People located in the manufacturing belt (NE of the US) might be more exposed to the flow of information about the manufacturing sector. Models (4) and (5) do not point at any major difference across the US. Nevertheless, as shown by the sticky information test, model (4) suggests that the variability in the median forecast of NE households is highly accounted for by the SPF forecast variability. This is not the case for the median forecast of agents located elsewhere.

Income. Estimating (5) shows that the forecast error of the top income group is almost exclusively accounted for by the inclusion of the bias in the SPF median forecast. In addition, the autoregressive component gradually loses importance as we move from the bottom income level to the top one. High income respondents stand out in their forecasting performance and traditionally exhibit less heterogeneity than other income groups, as pointed out by Curtin (2005). These results are probably driven by the marked differences in the expenditure pattern across individuals classified depending on their income level. As a matter of fact, low income households tend to spend a higher proportion of their income on necessity goods. As we show in Section 3, poorer households may actually consider their group-specific inflation when forecasting inflation. Indeed, the higher degree of within-group heterogeneity displayed by more economically disadvantaged households could be ascribed to the higher volatility of the rate of inflation computed from the Food and Beverage CPI component compared to the general CPI inflation.

Education. The results from the estimation of (4) are in line with those obtained under (1). On average, respondents with some college education (intermediate educational attainment) update their expectations more frequently, although the fit of the epidemiological model for these agents is not as good as that obtained for the respondents with a college degree (high-

est educational attainment). Moreover, model (5) clearly shows that the bias of the median SPF forecast increases its importance in explaining households' bias variability as the level educational attainment increases, thus signalling that the forecast error of highly educated participants moves in line with that of the professional forecasters, which are usually regarded as nearly rational agents. Once again it is important to stress that agents with higher educational attainment should display stronger interest in news on inflation, and that the cost of collecting and processing information declines in the level of educational attainment.[24]

5. Concluding Remarks

This paper establishes new stylized facts on the connection between consumers' socioeconomic background and their accuracy in predicting one-year-ahead CPI inflation. We use data on inflation expectations from the Survey of Consumer Attitudes and Behavior, conducted at the University of Michigan. We highlight significant differences in the process of expectation formation across respondents with different socioeconomic backgrounds. Wealthier, more educated, and male consumers tend to produce a lower sum of squared (forecast) errors, while socioeconomically less advantaged respondents produce more biased forecasts. However, we show that these are likely to form expectations by assuming as a reference point their group-specific CPI inflation. Conversely, more advantaged classes of respondents appear to be concerned with changes in the general CPI. These aspects have an obvious normative implication, especially for those central banks pursuing an inflation targeting regime. If this institutions are willing to enhance their transparency and optimize the effectiveness of their policy mandate, the general prescription is to improve the communication of both their inflation target and forecasts, so as to account for the marked degree of heterogeneity in households' capacity to access and process the relevant information.

We also explore the connection between consumers' socioeconomic background and the frequency at which they update their expectations, as well as the role of news in shaping this relationship. We stress the distinction between indicators of available news on prices and those indexing the actual degree of receptiveness to these news, arguing that the latter is crucial for a reliable assessment of the impact of news coverage on consumers' expectation bias.

Finally, we provide evidence on varying degrees of information stickiness across different demographic groups of participants. This finding has important implications for assessing the effects induced by monetary policy in contexts where expectations are updated in a staggered fashion, monetary non-neutrality *in primis*.

[24] This view is also confirmed by the micro data on consumers' expectations. Curtin (2005) documents that a key feature of the MS data is that the average change in the response of consumers with a college degree between the first and second interview is almost three times larger than that registered for the least educated consumers.

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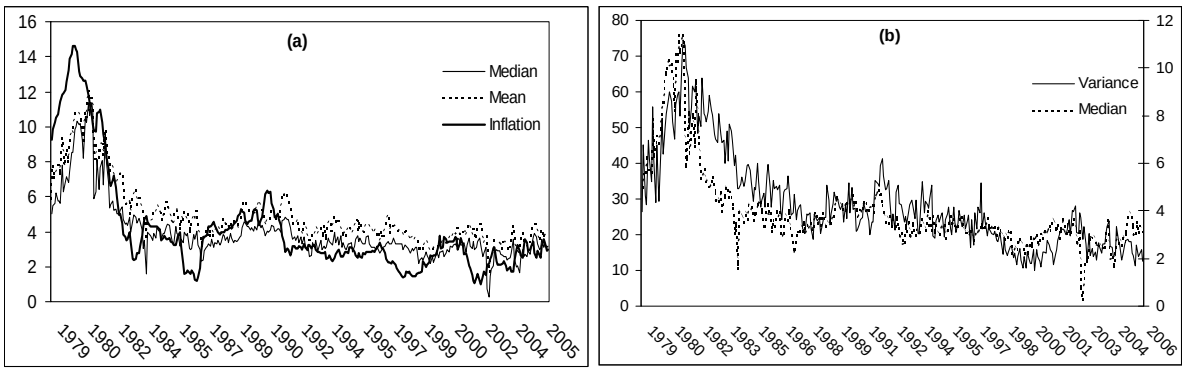
A. FIGURES AND TABLES



Figures 1(a)-(b). Median, mean, and variance of the MS distribution of inflation expectations (realized date): overall sample.

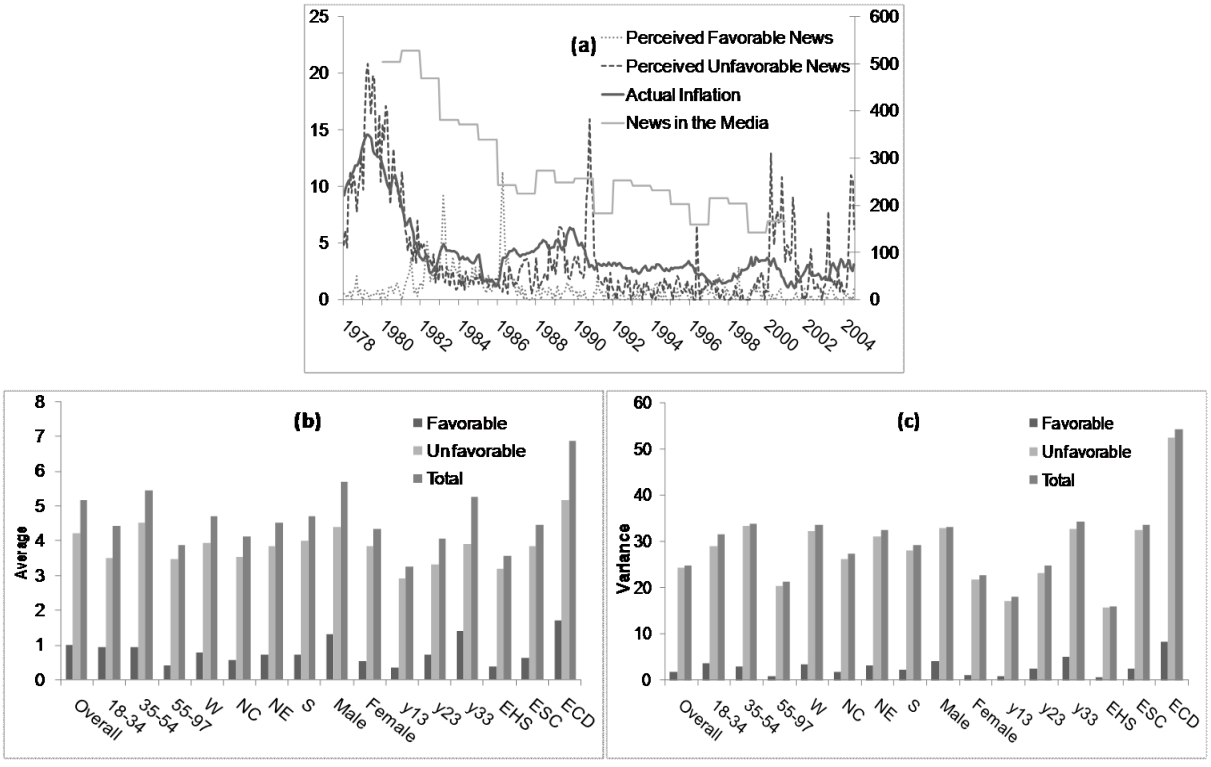


Figure 2. (a): Percentage of households hearing favorable and unfavorable news about prices in the past month, volume of news (sources: Washington Post and NY Times), actual inflation; (b): fraction of MS respondents that have heard favorable and unfavorable news about prices in the past month: average; (c): fraction of MS respondents that have heard favorable and unfavorable news about prices in the past month: variance.

Group	Mean	Median	Variance	Int. Range	Skew	Kurt	Average Inflation
Male	4.28	3.8	20.6	4.44	1.79	8.69	
Female	5.37	4.16	34.9	5.55	1.54	5.6	
18-34	5.14	4.16	29.5	4.93	1.64	6.52	
35-54	4.95	4.09	27.6	4.81	1.72	7.12	
55+	4.48	3.46	28.1	4.9	1.69	6.71	
W	4.91	4.09	27.1	4.89	1.61	6.69	
NC	4.77	3.9	27.6	4.79	1.73	7.1	
NE	4.82	3.92	28.9	5.09	1.61	6.54	
S	4.95	3.94	30.2	4.99	1.66	6.41	
Y13	5.28	3.95	36.7	5.83	1.44	5.08	
Y23	4.59	3.71	26.8	4.71	1.79	7.36	
Y33	4.01	3.57	19.2	4.29	1.9	9.41	
EHS	5.23	3.97	34.8	5.43	1.53	5.47	
ESC	4.78	3.96	26.4	4.77	1.66	6.97	
ECD	4.51	4.11	20	4.27	1.79	8.95	
Overall	**4.87**	**4.16**	**28.7**	**5.55**	**1.73**	**6.98**	**4.19**

Table 1. Forecasts conditioned on the demographic background: empirical moments (overall sample).

Group	Mean SSE	Median SSE
Male	741	849
Female	1474	1089
18-34	1143	900
35-54	1035	810
55+	1253	1560
W	1021	834
NC	1021	1030
NE	1115	1106
S	1174	1033
Y13	1610	772
Y23	834	507
Y33	431	392
EHS	1420	1183
ESC	1012	980
ECD	759	745
Overall	**1015**	**1089**

Table 2(a). Forecasts conditioned on the demographic background: mean and median SSE (1978:01-2005:02).

Group	Mean	Median	Variance	Int. Range	Skew	Kurt	Average Inflation
Male	5.64	5.05	29.7	5.77	1.41	6.38	
Female	6.65	5.15	46.6	7.58	1.18	4.02	
18-34	6.78	5.56	40.5	6.48	1.25	4.57	
35-54	6.41	5.37	37.8	6.36	1.32	5.19	
55+	5.27	4	37.2	6.37	1.4	5.32	
W	6.33	5.4	37.2	6.43	1.26	5.15	
NC	6	4.92	37.9	6.39	1.36	5.19	
NE	6.27	5.13	40.3	6.75	1.27	4.69	
S	6.18	4.99	40.7	6.58	1.32	4.81	
Y13	6.12	4.46	48.6	7.8	1.22	4.02	
Y23	5.7	4.6	37.2	6.27	1.46	5.49	
Y33	5.28	4.73	28.9	5.7	1.48	6.6	
EHS	6.29	4.77	45.4	7.19	1.25	4.24	
ESC	6.08	5.11	35.7	6.18	1.34	5.34	
ECD	6.12	5.71	28.2	5.38	1.3	6.19	
Overall	**6.18**	**5.15**	**39.3**	**7.58**	**1.33**	**4.96**	**6.2**

Table 2(b). Demographic groups and empirical moments (1978.01-1987.12).

Group	Mean	Median	Variance	Int. Range	Skew	Kurt	Average Inflation
Male	3.36	2.94	14.5	3.54	2.05	10.26	
Female	4.5	3.49	27	4.17	1.78	6.68	
18-34	4.03	3.21	22	3.89	1.91	7.85	
35-54	3.95	3.22	20.7	3.76	1.99	8.42	
55+	3.94	3.09	22	3.9	1.88	7.65	
W	3.94	3.19	20.3	3.83	1.85	7.74	
NC	3.93	3.21	20.6	3.7	1.98	8.39	
NE	3.84	3.09	21.2	3.96	1.84	7.79	
S	4.11	3.22	23.1	3.91	1.89	7.5	
Y13	4.81	3.65	29.9	4.7	1.57	5.69	
Y23	3.95	3.2	20.8	3.82	1.98	8.43	
Y33	3.27	2.9	13.6	3.48	2.13	11.02	
EHS	4.51	3.42	27.6	4.24	1.72	6.31	
ESC	3.89	3.18	20.1	3.81	1.88	8.08	
ECD	3.42	3.03	14.5	3.51	2.12	10.82	
Overall	**3.98**	**3.49**	**21.6**	**4.17**	**2.01**	**8.35**	**2.98**

Table 2(c). Demographic groups and empirical moments (1988.01-2005.02).

	Mean Forecast	*SSE mean*	*SSE* mean*	*Median Forecast*	*SSE median*	*SSE* median*	*CPI Inflation*
Age 55+	4.08	587	466	3.07	466	523	3.53
Y13	5.11	1389	971	3.77	441	413	3.56
Y23	4.33	730	645	3.45	370	350	3.43
Y33	3.7	363	445	3.26	295	408	3.4
EHS	4.79	1058	955	3.55	397	415	3.47
ESC	4.23	663	661	3.44	364	441	3.43
ECD	3.89	468	521	3.5	345	460	3.46
Overall							**3.23**

Table 3. Group-specific forecast accuracy based on the mean and the median of the MS distribution (1981:01-2004:01). Notes: SSE_i^*, $i = \{mean, median\}$ denotes the SSE with respect to group-specific CPI inflation, whereas SSE_i is computed from overall CPI inflation forecast error. CPI $Inflation$ denotes the (time) average inflation for each CPI considered.

GROUP	λ	Adj R^2	DW	λ-pre	λ-post	Wald
18-34	0.200	0.862	2.570	0.237	0.164	0.382
	0.043***			0.083***	0.025***	
35-54	0.181	0.884	2.412	0.226	0.143	0.250
	0.033***			0.072***	0.029***	
55-97	0.205	0.716	2.419	0.212	0.199	0.842
	0.040***			0.067***	0.042***	
EHS	0.110	0.822	2.591	0.223	0.076	0.008
	0.018***			0.055***	0.018***	
ESC	0.281	0.825	2.450	0.371	0.216	0.192
	0.051***			0.119***	0.039***	
ECD	0.236	0.908	2.414	0.232	0.245	0.902
	0.074***			0.103***	0.058***	
Fem	0.111	0.848	2.553	0.217	0.066	0.000
	0.021***			0.061***	0.017***	
Male	0.166	0.920	2.308	0.139	0.218	0.209
	0.047***			0.063**	0.056***	
NC	0.235	0.827	2.424	0.329	0.162	0.021
	0.036***			0.072***	0.404***	
NE	0.346	0.786	2.346	0.464	0.247	0.007
	0.046***			0.080***	0.050***	
W	0.259	0.843	2.552	0.290	0.232	0.630
	0.063***			0.121**	0.054***	
S	0.178	0.846	2.498	0.306	0.117	0.049
	0.033***			0.096***	0.025***	
Y13	0.148	0.553	2.734	0.280	0.117	0.006
	0.020***			0.059***	0.020***	
Y23	0.272	0.787	2.453	0.570	0.165	0.002
	0.049***			0.131***	0.041***	
Y33	0.258	0.904	2.233	0.235	0.295	0.599
	0.073***			0.114**	0.053***	

Table 4. Least squares estimation of $\pi^e_{t|t-12} = \lambda\pi^F_{t|t-12} + (1-\lambda)\,\pi^e_{t-1|t-13}$. Notes: Adj R^2 denotes the adjusted R^2. λ-pre denotes the share of agents updating their information set in every month during the 1978:01-1988:12 time interval, while λ-post refers to the second part of the sample. The last column (Wald) reports the probability to accept the null hypothesis H_0: λ-pre=λ-post. ***/**/* denotes significant at 1/5/10 percent level, respectively. Newey-West standard errors have been computed.

GROUP	GAP				GAP*			
	γ_0	γ_1	Adj R^2	DW	γ_0	γ_1	Adj R^2	DW
18-34	0.512	0.303	0.378	1.166	0.251	0.725	0.359	0.395
	0.217**	0.077***			0.389	0.214***		
35-54	0.082	0.291	0.336	1.147	-0.315	0.738	0.313	0.422
	0.242	0.071***			0.709	0.251***		
55-97	0.972	0.188	0.102	0.864	-0.294	1.174	0.355	0.497
	0.172***	0.059***			0.674	0.392***		
EHS	1.662	0.146	0.064	0.934	0.382	1.108	0.351	0.390
	0.211***	0.048***			0.693	0.375***		
ESC	0.533	0.217	0.224	1.341	0.137	0.828	0.361	0.398
	0.186***	0.063***			0.586	0.273***		
ECD	-0.472	0.244	0.390	0.871	-0.521	0.579	0.347	0.363
	0.256*	0.068***			0.540	0.171***		
Fem	1.514	0.188	0.125	1.076	0.014	1.007	0.394	0.331
	0.218***	0.059***			0.756	0.324***		
Male	-0.142	0.206	0.392	1.012	-0.934	0.807	0.306	0.315
	0.150	0.044***			0.791	0.281***		
NC	0.674	0.198	0.201	1.425	-0.060	0.951	0.375	0.492
	0.150***	0.051***			0.527	0.287***		
NE	0.655	0.188	0.190	1.608	0.112	0.832	0.331	0.486
	0.148***	0.047***			0.593	0.289***		
W	0.344	0.269	0.363	1.058	0.409	0.682	0.306	0.373
	0.187*	0.065***			0.502	0.228***		
S	0.796	0.171	0.185	1.251	0.136	0.814	0.286	0.328
	0.164***	0.041***			0.635	0.302***		
Y13	2.921	0.045	0.000	1.283	2.712	0.183	0.042	1.044
	0.269***	0.070			0.293***	0.183*		
Y23	0.567	0.183	0.190	1.308	0.967	0.225	0.114	0.603
	0.174***	0.060***			0.233***	0.069***		
Y33	-0.137	0.174	0.226	1.192	0.614	0.194	0.101	0.539
	0.241	0.079**			0.279**	0.073***		

Table 5. Least squares estimation of $GAP_t = \gamma_0 + \gamma_1 NEWS_t$ (LHS) and $GAP_t^* = \gamma_0 + \gamma_1 NEWS_t$ (RHS). Notes: Adj R^2 denotes the adjusted R^2. DW denotes the Durbin-Watson test for serial correlation. ***/**/* denotes significant at 1/5/10 percent level, respectively. Newey-West standard errors have been computed.

GROUP	*Favorable News*					*Unfavorable News*				
	γ_0	$\gamma_{1(\mathbb{I}=1)}$	$\gamma_{1(\mathbb{I}=0)}$	Adj R^2	DW	γ_0	$\gamma_{1(\mathbb{I}=1)}$	$\gamma_{1(\mathbb{I}=0)}$	Adj R^2	DW
18-34	1.889	-0.245	-0.139	0.011	0.860	0.713	0.192	0.418	0.539	1.582
	0.325***	0.104**	0.048***			0.217**	0.077***	0.077***		
35-54	1.686	-0.369	-0.154	0.022	0.856	0.412	0.132	0.389	0.491	1.572
	0.307***	0.115***	0.063**			0.123***	0.044***	0.052***		
55-97	1.526	0.282	0.068	0.001	0.770	0.990	0.322	0.102	0.145	1.073
	0.227***	0.269	0.170			0.166***	0.083***	0.034***		
EHS	2.331	-0.651	-0.405	0.037	1.040	1.683	0.082	0.222	0.113	0.975
	0.213***	0.205***	0.093***			0.200***	0.071	0.039***		
ESC	1.473	-0.228	-0.075	0.007	1.101	0.686	0.087	0.306	0.336	1.463
	0.253***	0.076***	0.119			0.141***	0.040**	0.071***		
ECD	1.188	-0.172	-0.039	0.007	0.495	-0.063	0.153	0.308	0.502	1.131
	0.374***	0.086**	0.042			0.096	0.033***	0.068***		
Fem	2.446	-0.626	-0.231	0.033	1.094	1.645	0.054	0.279	0.224	1.269
	0.217***	0.141***	0.114**			0.179***	0.069	0.035***		
Male	0.897	-0.026	-0.008	-0.006	0.591	0.143	0.140	0.244	0.445	1.052
	0.227***	0.083	0.047			0.096	0.026***	0.050***		
NC	1.467	-0.259	-0.145	0.009	1.179	0.764	0.148	0.243	0.252	1.519
	0.193***	0.079***	0.083*			0.115***	0.032***	0.058***		
NE	1.482	-0.265	-0.107	0.011	1.367	0.738	0.159	0.259	0.271	1.786
	0.195***	0.107**	0.030***			0.105***	0.048***	0.044***		
W	1.604	-0.286	-0.056	0.015	0.730	0.523	0.145	0.383	0.528	1.400
	0.288***	0.077***	0.057			0.117***	0.042***	0.053***		
S	1.664	-0.341	-0.190	0.034	1.110	0.867	0.107	0.245	0.291	1.436
	0.195***	0.089***	0.046***			0.134***	0.046**	0.031***		
Y13	3.269	-0.692	-0.604	0.043	1.408	2.797	0.034	0.184	0.021	1.316
	0.257***	0.168***	0.138***			0.266***	0.081	0.075**		
Y23	1.283	-0.282	-0.068	0.016	1.220	0.609	0.135	0.313	0.316	1.486
	0.176***	0.080***	0.048			0.128***	0.043***	0.060***		
Y33	0.614	-0.001	0.005	-0.007	0.923	0.106	0.093	0.255	0.309	1.289
	0.197***	0.072	0.032			0.128	0.027***	0.125**		

Table 6. Least squares estimation of $GAP_t = \gamma_0^i + \gamma_1^i \mathbb{I} NEWS_t^i + \gamma_2^i (1 - \mathbb{I}) NEWS_t^i$, $i = \{\text{FAVORABLE, UNFAVORABLE}\}$. Notes: $\mathbb{I}$ is an indicator function, whose value equals 1 when $|\pi_t - \bar{\pi}| \leq |\pi_{t-1} - \bar{\pi}|$ and 0 otherwise, while $\bar{\pi}$ denotes the average rate of inflation over the whole time window considered. Adj R^2 denotes the adjusted R^2. DW denotes the Durbin-Watson test for serial correlation. ***/**/* denotes significant at 1/5/10 percent level, respectively. Newey-West standard errors have been computed.

Group	Constant	$Infl_{t-12}$	y_{t-12}	$Infl_{t-1\ t-13}$	$SPF_{t\ t-12}$	i_{t-12}	Adj R^2	DW
18-34	1.107	0.202	0.015	0.313	0.466	-0.061	0.892	1.989
	0.145***	0.042***	0.033	0.056***	0.081***	0.020***		
	0.000	0.270	0.002	0.289	0.381	-0.048		
35-54	0.923	0.186	0.025	0.517	0.216	-0.040	0.909	2.093
	0.136***	0.040***	0.029	0.050***	0.067***	0.017***		
	0.000	0.265	0.003	0.491	0.183	-0.032		
55-97	1.619	0.160	0.064	0.442	0.150	-0.070	0.763	2.054
	0.190***	0.042***	0.034**	0.053***	0.076***	0.021***		
	0.000	0.274	0.016	0.376	0.147	-0.046		
EHS	1.545	0.157	0.013	0.497	0.169	-0.048	0.858	2.124
	0.183***	0.038***	0.028	0.051***	0.065***	0.018***		
	0.000	0.272	0.002	0.456	0.172	-0.042		
ESC	1.455	0.278	0.024	0.293	0.325	-0.100	0.864	2.024
	0.164***	0.046***	0.034	0.057***	0.081***	0.022***		
	0.000	0.394	0.004	0.265	0.271	-0.067		
ECD	0.593	0.205	0.046	0.497	0.271	-0.055	0.918	2.060
	0.119***	0.041***	0.030*	0.053***	0.072***	0.019***		
	0.000	0.267	0.006	0.473	0.211	-0.038		
Fem	1.376	0.145	0.031	0.480	0.246	-0.039	0.886	2.075
	0.165***	0.036***	0.028	0.052***	0.066***	0.017***		
	0.000	0.232	0.005	0.448	0.239	-0.035		
Male	0.566	0.128	0.030	0.647	0.169	-0.052	0.924	2.091
	0.113***	0.036***	0.025	0.048***	0.059***	0.016***		
	0.000	0.188	0.005	0.624	0.146	-0.037		
NC	1.218	0.167	0.063	0.449	0.247	-0.056	0.849	2.091
	0.163***	0.043***	0.033**	0.053***	0.077***	0.021***		
	0.000	0.253	0.012	0.407	0.223	-0.043		
NE	1.162	0.128	0.065	0.333	0.461	-0.065	0.821	1.969
	0.166***	0.047***	0.039**	0.055***	0.092***	0.024***		
	0.000	0.178	0.011	0.291	0.396	-0.052		
W	1.286	0.282	-0.011	0.306	0.322	-0.071	0.876	2.063
	0.156***	0.046***	0.034	0.056***	0.080***	0.021***		
	0.000	0.388	-0.001	0.280	0.264	-0.052		
S	1.265	0.188	0.020	0.473	0.194	-0.046	0.876	2.090
	0.159***	0.040***	0.030	0.052***	0.068***	0.018***		
	0.000	0.295	0.003	0.438	0.180	-0.038		
Y13	2.580	0.198	0.059	0.254	0.179	-0.020	0.689	2.042
	0.236***	0.046***	0.037*	0.057***	0.083**	0.023		
	0.000	0.353	0.011	0.193	0.190	-0.021		
Y23	1.650	0.270	0.025	0.224	0.282	-0.045	0.846	1.925
	0.161***	0.042***	0.031	0.058***	0.072***	0.020***		
	0.000	0.451	0.003	0.197	0.280	-0.045		
Y33	0.598	0.178	0.027	0.522	0.199	-0.030	0.917	1.996
	0.104***	0.035	0.024***	0.053***	0.061***	0.016**		
	0.000	0.279	0.004	0.496	0.186	-0.028		

Table 7. Least squares estimation of model (4) Notes: Adj R^2 denotes the adjusted R^2. DW denotes the Durbin-Watson test for serial correlation. ***/**/* denotes significant at 1/5/10 percent level, respectively. Newey-West standard errors have been computed. The third entry after each estimated coefficient reports the partial R^2 associated with the respective regressor.

Group	Constant	$Infl_{t-13}$-$Infl_{t-13\ t-25}$	Δy_{t-12}	$\Delta(i_{t-12}-r_{t-12})$	$Infl_t$-$SPF_{t\ t-12}$	$\Delta Infl_{-12}$	$\Delta NEWS_{t-12}$	Adj R^2	DW
18-34	-0.939	0.055	-0.020	-0.005	0.641	0.205	-0.055	0.775	1.548
	0.066***	0.047	0.020	0.029	0.055***	0.051***	0.009***		
	0.000	0.015	-0.003	0.001	0.634	0.163	-0.031		
35-54	-0.691	0.106	0.012	0.003	0.592	0.243	-0.052	0.754	1.051
	0.061***	0.048**	0.021	0.031	0.056***	0.054***	0.008***		
	0.000	0.029	0.002	-0.001	0.570	0.186	-0.027		
55-97	-0.204	0.510	-0.063	0.044	0.431	0.353	-0.104	0.706	1.131
	0.058***	0.049***	0.027**	0.039	0.069***	0.069***	0.015***		
	0.000	0.316	-0.004	-0.007	0.299	0.106	0.002		
EHS	-0.640	0.412	-0.006	-0.027	0.491	0.358	-0.119	0.756	0.994
	0.078***	0.052***	0.023	0.034	0.066***	0.067***	0.014***		
	0.000	0.208	-0.001	0.007	0.411	0.169	-0.033		
ESC	-0.508	0.187	-0.023	0.054	0.511	0.289	-0.049	0.674	1.269
	0.061***	0.052***	0.024	0.036*	0.064***	0.060***	0.010***		
	0.000	0.064	-0.003	-0.012	0.457	0.198	-0.025		
ECD	-0.345	0.029	-0.036	0.001	0.513	0.245	-0.032	0.743	1.227
	0.043***	0.045	0.020**	0.029	0.050***	0.045***	0.006***		
	0.000	0.006	-0.003	0.000	0.531	0.229	-0.014		
Fem	-0.974	0.216	0.000	-0.001	0.666	0.208	-0.090	0.783	1.128
	0.081***	0.051***	0.021	0.031	0.064***	0.063***	0.012***		
	0.000	0.094	0.000	0.000	0.610	0.122	-0.040		
Male	-0.099	0.214	-0.038	0.005	0.458	0.280	-0.058	0.726	0.819
	0.041***	0.052***	0.020**	0.030	0.056***	0.054***	0.008***		
	0.000	0.069	-0.004	-0.002	0.467	0.214	-0.013		
NC	-0.461	0.256	-0.041	0.066	0.553	0.239	-0.049	0.687	1.028
	0.064***	0.055***	0.025*	0.036**	0.066***	0.066***	0.010***		
	0.000	0.101	-0.003	-0.013	0.486	0.132	-0.010		
NE	-0.697	0.035	-0.041	0.039	0.786	0.016	-0.046	0.678	1.410
	0.065***	0.054	0.025**	0.037	0.069***	0.065	0.011***		
	0.000	0.014	-0.003	-0.008	0.695	0.009	-0.021		
W	-0.724	0.043	0.018	-0.025	0.597	0.189	-0.041	0.701	1.380
	0.061***	0.048	0.023	0.034	0.058***	0.054***	0.009***		
	0.000	0.011	0.004	0.008	0.562	0.145	-0.023		
S	-0.627	0.222	-0.003	-0.003	0.603	0.239	-0.077	0.736	1.008
	0.068***	0.053***	0.023	0.033	0.067***	0.065***	0.011***		
	0.000	0.086	-0.001	0.001	0.536	0.143	-0.024		
Y13	-1.080	0.276	-0.013	0.003	0.568	0.248	-0.103	0.491	1.264
	0.109***	0.056***	0.028	0.040	0.095***	0.082***	0.016***		
	0.000	0.002	0.000	0.000	0.423	0.076	-0.071		
Y23	-0.613	0.144	-0.009	-0.052	0.570	0.229	-0.047	0.596	1.130
	0.068***	0.052***	0.023	0.034*	0.082***	0.068***	0.011***		
	0.000	-0.019	0.000	0.011	0.553	0.152	-0.027		
Y33	-0.104	0.078	-0.008	-0.029	0.617	0.142	-0.040	0.692	0.945
	0.041***	0.047**	0.018	0.026	0.064***	0.051***	0.008***		
	0.000	-0.009	0.000	0.007	0.721	0.134	-0.012		

Table 8. Least squares estimation of model (5). Notes: Adj R^2 denotes the adjusted R^2. DW denotes the Durbin-Watson test for serial correlation. ***/**/* denotes significant at 1/5/10 percent level, respectively. Newey-West standard errors have been computed. The third entry after each estimated coefficient reports the partial R^2 associated with the respective regressor.