The Misperception of Inflation by Irish Consumers

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Abstract: How people perceive and forecast inflation has the potential to impact on a range of economic outcomes. We reveal large, systematic overestimation of inflation by Irish consumers, which varies by social group. In contrast to previous work in this area, our models suggest the upward bias and the variation by social group should be considered substantially separate phenomena. We also offer evidence that inflation misperceptions are linked to attitudes and intentions with respect to consumption and saving and, hence, are likely to affect household decision-making. The findings therefore raise issues regarding the relationship between financial literacy and consumer behaviour.

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1. Introduction

This paper uses data from the EU Consumer Survey to explore the perception of inflation in Ireland between 2002 and 2007. The survey reveals large and systematic inaccuracies in perceptions, with less than 15 per cent of the population perceiving inflation to be within two percentage points of its actual value, as measured by the CPI. We examine how the scale of misperception varies by social group. The data also offer the opportunity to relate the misperception of inflation to attitudes and intentions regarding future consumption and saving. The aim is to offer a contribution to understanding the systematic misperception of price changes and to give an indication of why misperceptions may be important.

How people perceive and forecast inflation has the potential to impact on a variety of economic outcomes. Systematic influences on individual estimates of inflation can be expected to affect wage negotiations, consumer confidence and transmission of monetary policy. In the Irish context, perceptions of inflation have played an important role in the negotiation of social partnership agreements. On an individual level, accurate estimates of inflation are important when undertaking major financial decisions, such as taking out a loan or investing in a pension plan, as well as for ongoing financial management of personal savings, consumption and credit. In short, how agents process and respond to information about price changes matters.

We show that inaccuracies in the perception of inflation are systematic, with a large majority overestimating price rises substantially. We then test competing hypotheses regarding the likely behavioural impact of this overestimation. One possibility is that misperception has no effect on household decisions. Another is that those households that perceive inflation to be too high will therefore underestimate the real interest rate and hence to be less inclined to save and more inclined to borrow and spend. Alternatively, households with high perceptions of inflation may believe the present time offers poor value for money, making them less inclined to spend.

2. Relationship to previous research

In both theoretical and applied macroeconomics, expected (as distinct from perceived) inflation has come to be considered an important variable. It features in a wide range of macroeconomic models, especially following Lucas (1973). Expected inflation appears regularly in the crosshairs of central bankers with responsibility for inflation targets. From an empirical perspective, however, perceived and expected inflation are less easily brought into focus. Three existing strands of empirical literature are relevant to the present paper.

First, the "rational expectations revolution" rapidly inspired attempts to assess the accuracy and rationality, or otherwise, of direct estimates of inflation expectations (Fama, 1975; Carlson, 1977; De Menil and Bhalla, 1975). Given rational expectations, it can be hypothesised that inflation expectations will be unbiased and will take account of publicly available information. Hence, this line of inquiry seeks simply to compare *ex ante* expected inflation, as expressed by survey respondents (including both the general public and professional economists), with *ex post* CPI data. Although the empirical comparison is in principle straightforward, the pattern of results has taken some time to be resolved, because the accuracy of people's predictions turns out to depend on the medium-term inflation climate. It now seems clear that the mean forecasts of agents do not conform to the hypothesis. Both the general public and professional economists have tended to overestimate future inflation since the end of the 1970s, but underestimated it during that period of high inflation, while errors display both serial correlation and correlation with other publicly available information, such as interest rates and unemployment (Thomas, 1999).

Although these results constitute a *prima facie* refutation of the rational expectations hypothesis, caution is warranted because there may be times when expected values derived from rational expectations nevertheless appear biased (Friedman and Schwartz, 1982). Suppose agents believe there is a probability of a specific event occurring that would impact upon the variable of interest. Then, for the period this probabilistic event fails to occur, agents may produce forecasts that appear *ex post* to be biased and to produce serially correlated errors. This argument, dubbed the "Peso problem" (after the example employed in its original exposition, which referred to an

anticipated devaluation in the Mexican currency), offers possible rescue to the rational expectations position in the face of biased inflation forecasts with correlated errors.

Nevertheless, Jonung and Laidler (1988; see also Jonung, 1981) found a simple way to bypass the Peso problem: working with direct measures of *perceived* current inflation rather than *expected* future inflation. The advantage of investigating perceptions rather than expectations is that the former obviously cannot be biased by probabilistic events that fail to occur. Nevertheless, individual measures of current perceptions are very highly correlated with individual measures of expectations (0.735 in our own data). Using Swedish data collected between 1979 and 1985, a period that covered a sharp cycle in Swedish inflation, Jonung and Laidler confirmed the same result as arises for expected inflation during the 1970s and thereafter: mean perceptions followed a smoother path over the cycle than actual inflation, underestimating the extent of both the rise and the subsequent fall. It is hard to reconcile rational expectations with this systematic misperception of inflation. The authors argued, however, for a separation of the hypothesis of rational expectations from the broader economic concept of rationality. Their favoured interpretation was that the systematic misperception of inflation they observed reflected the cost of obtaining the information necessary to gauge price changes accurately – a "bounded rationality" explanation.

Further work on inflation perceptions has followed (see Ranyard et al., 2008, for review). Ranging from 1981 through to 2008, a period of generally low and stable inflation in developed economies, studies have shown that mean perceptions of inflation tend to be higher than official figures, by at least several percentage points (e.g. Bryan and Venkatu, 2001, with US data) and sometimes over ten percentage points (e.g. Bates and Gabor, 1986, with UK data).

A number of hypotheses have been advanced as possible explanations for overestimation. Jonung (1981) argues that people may be influenced by their past experience of inflation, such that those who have lived through periods of higher inflation tend to have an upward bias. Bates and Gabor (1986) cite Tversky and Kahneman's (1974) "availability" heuristic, suggesting that biases may result if consumers can more easily recall frequent, recent and larger price changes. Brachinger (2008) also borrows from the work of Kahneman and Tversky (1979), applying Prospect Theory to inflation perceptions. If price increases are felt as losses, they may be

weighted more heavily than equivalent price gains. Soroka (2006) provides evidence that "social amplification" through the media affects perceptions, since the media are more inclined to report negative than positive news on inflation. Lastly, it is possible that systematic biases in the way past prices are remembered plays a part (e.g. Kemp, 1987; Brachinger, 2008).

The above strand of relevant empirical work takes as its variable of interest the mean perception or expectation of inflation across sampled populations. A more recent strand concentrates on systematic variation within individual estimates of inflation. Perceptions and expectations of inflation vary considerably by social group. In the US, the mean inflation perceptions of women, younger people, people of lower educational attainment, single people and members of minorities, are higher than those of other social groups (Bryan and Venkatu, 2001a; 2001b). Similar differences by gender and socio-economic group have been reported in Austria (Fluch and Stix, 2007) and Italy (Malagrini, 2008). Rarely has multivariate analysis of such differences been attempted, however, probably because of the econometric difficulties associated with the distribution of perceptions. We elaborate on this further and propose a new modelling approach in Section 3.

One possible explanation is that the official inflation figure is inappropriate for some groups.[1] An expenditure-weighted CPI is biased towards higher income households. Similarly, there may be a difference in real inflation for the goods purchased by men and those purchased by women (Jonung, 1981). The scale of the intergroup differences suggests there is more to it, however. For instance, weighting the basket of goods by population rather than expenditure makes only a marginal difference to the CPI, accounting for just a small fraction of the difference in responses between groups, in the US at least (Kokoski, 2000). Moreover, perceptual differences by gender have been recorded too consistently across time periods and nations for differences among product categories to account for them.

The general tendency to overestimate inflation and the variation in inflation perceptions across social groups may or may not be linked. As detailed in Section 3, the distribution of inflation perceptions for all social groups is subject to a strong right-skew, such that mean perceptions are

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[1] It may also be the case that the official measure of inflation, the consumer price index, is not the appropriate benchmark. Respondents are asked what has happened to prices in general, not what has happened to the CPI.

higher than median perceptions. The danger, therefore, is that where one group, say women, is observed to have a higher mean perception than another (men), we conclude that women are particularly likely to overestimate inflation (e.g. Bryan and Venkatu, 2001b). Yet, given the strong skew in the distribution of individual estimates, it may be the case both that women have a higher mean perception and that they are more likely also to underestimate inflation. That is, with a skewed distribution, it is not clear whether the intergroup difference is due to a group possessing an upward bias or to that group perceiving inflation less accurately among a population where the perception of all groups is upwardly skewed.

Nevertheless, it is difficult to reconcile the very wide range of survey responses regarding perceptions and expectations of inflation with the idea that respondents take a rational approach to price changes. Overestimation is a consistent phenomenon and the scale of differences in perception between social groups is quite dramatic. The findings have contributed to concerns regarding levels of individual financial literacy, particularly in view of the deregulation of financial services markets and increased availability of credit in modern developed economies (e.g. Braunstein and Welch, 2002; de Meza, Irlenbusch and Reyniers, 2008). Underlying such concerns is the assumption that lack of financial literacy, in this case the misperception of inflation, is likely to feed through to behaviour in the marketplace. Yet the impact of misperceptions on economic decision-making has been much less explored (Ranyard et al., 2008). Katona's (1975) finding that consumer sentiments are linked to consumption behaviour provides some evidence that people's general economic outlook affects their economic decisions. Our data allow us to explore the behavioural link further.

The final strand of relevant empirical literature concerns the impact on perceived inflation of the 2002 Euro cash changeover. A large number of studies based on a range of survey instruments have shown that perceived inflation rose sharply across the whole Euro Area for several years following the cash changeover, despite stable and low inflation during the period (see Dohring and Mordonu, 2007, for review). This striking phenomenon raises a further challenge to the assumption of rational expectations, although its origin remains a puzzle.

The present study does not directly address potential explanations for the impact of the Euro changeover, which is the subject of a separate paper (*in preparation*). However, the phenomenon

is relevant in two respects. First, any theory of what drives the distribution of individual inflation perceptions may shed light on why this large step jump in perceptions occurred. Second, the data for the present study were gathered during the period when inflation perceptions in Ireland were strongly affected by the cash changeover, so it may be an important influence on the resulting estimates.

Our analysis was initially motivated by the opportunity to exploit new indicators added to the EU Consumer Survey. Previously, the survey only obtained qualitative responses, where respondents indicated whether, compared with 12 months ago, prices were "lower", "about the same", "a little higher", "quite a bit higher" or "very much higher". From the third quarter 2002, the Irish survey further asked respondents to put a percentage figure on how much prices had increased (or decreased). This change offers the opportunity to model the determinants of responses more accurately. It also allows the responses to be related to other individual-level indicators on the survey, including attitudes towards consumption and saving, economic optimism (both general and personal) and intentions regarding future consumption.

3. Data

The data for the analysis are drawn from the EU Consumer Survey for Ireland. Each month a representative sample of adults aged 16 and over was contacted by telephone based on a random stratified sampling procedure. Prior to 2002, the survey asked consumers about their perception and expectation regarding the *direction* of price changes (see above), but did not attempt to measure the magnitude of that change; the perceived or expected inflation rate. From July 2002, however, the price questions in the survey were expanded to ask about the magnitude of perceived recent changes in prices of the last 12 months, as well as expectations for price changes over the coming 12 months. Following Jonung and Laidler (1988), the main variable of interest is perceived inflation, which is obtained from the survey question:

"By what per cent do you think that prices have increased/decreased in the last 12 months?"

Respondents are not prompted or required to select from a range of responses – the question is open-ended[2]. The dataset available for this analysis covers the period July 2002 to December 2007. This provides us with a total dataset of 76,715 respondents, of which 66 per cent provided an estimate for the current rate of inflation.

We first consider how consumers perceived the direction of price change. Table 1 presents consumers' perceptions on an annual basis. Over the period, the CPI completed a cycle (right column), beginning and ending with inflation at just under five per cent, falling to just over two in the middle. The bulk of consumers throughout the period perceived that prices had risen. Over 30 per cent thought that prices were "very much higher" and 35 per cent responded that prices were "quite a bit higher". However, the proportion of consumers who responded that prices were "very much" higher declined, from nearly one in two consumers in 2002 to less than one in five by 2007, despite the fact that inflation as measured by the CPI was largely unchanged. This pattern of falling qualitative perceptions, beginning at what was in fact an historical high, is typical of inflation perceptions across the Euro Area for the period following the cash changeover (Dohring and Mordonu, 2007).

Table 1: *Mean perception of prices compared with 12 months ago*

	Very much higher	Quite a bit higher	A little higher	About the same	Lower	Total	Mean CPI
			%				
2002*	48.9	31.7	16.4	2.8	0.1	100	4.6
2003	45.7	32.4	17.9	3.6	0.4	100	3.5
2004	32.7	37.1	23.4	5.9	0.9	100	2.2
2005	28.1	34.9	28.6	7.7	0.8	100	2.4
2006	22.1	37.7	30.5	8.9	0.9	100	4.0
2007	18.4	38.9	32.1	10.1	0.5	100	4.9
Total	**32.5**	**35.5**	**24.9**	**6.5**	**0.6**	**100**	**3.5**

* Six months from July-Dec

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[2] This is in contrast to the University of Michigan and ISAE (Italy) where confirmation is sought if the answer exceeds a certain level.

We next turn to quantitative estimates of inflation. Consistent with previous findings in other countries, respondents substantially overstated price rises. Overall, the mean estimate by consumers for the current rate of inflation was 13.2 per cent, compared with a mean of 3.5 per cent for the official measure of annual inflation. Figure 1 shows that overestimation was fairly consistent. Although the average estimate declined over the period, it remained substantially above the official record of inflation.

Figure 1: *Inflation Perceptions: Survey Data compared to the CPI*
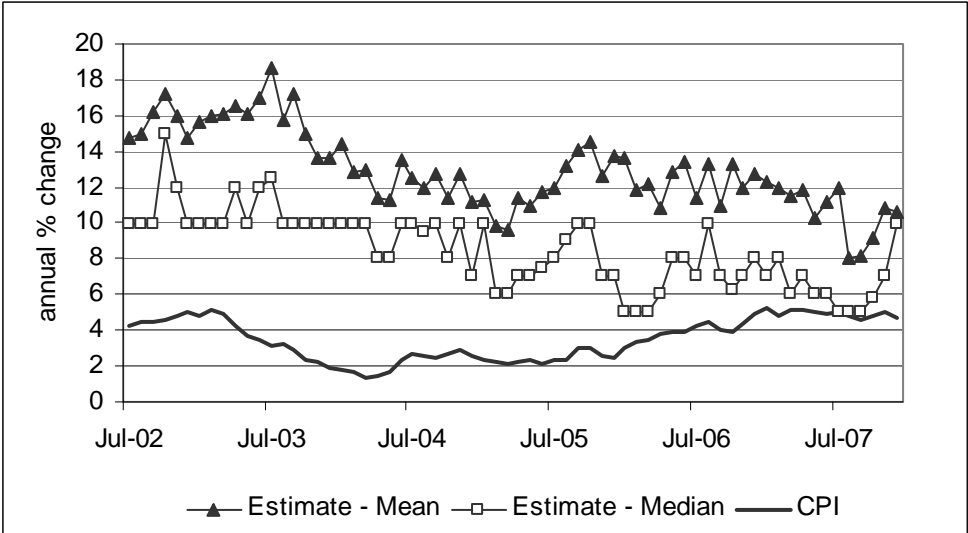
Sources: CSO and EU Consumer Survey

Taken as a whole, for those who might stress the rational nature of economic agents, the quantitative estimates are sobering. Across this five-and-a-half year period of relatively low and stable inflation, less than 15 per cent of the population perceived inflation to be within 2 percentage points of its actual value, as measured by the CPI. Although the proportion estimating inflation within this range increased across the period, as the euro changeover effect diminished, the figure was still less than 20 per cent in 2007.

Table 2 reports the mean inflation perceptions for a number of different demographic and socio-economic groups. Again, the pattern is consistent with previous findings. Current inflation is significantly and substantially overestimated by all groups, although it is evident that differences between groups exist. For example, the mean estimate of male respondents is 10.7 per cent,

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compared to a mean of 15.4 per cent estimated by female respondents. Inflation perceptions fall as educational attainment rises. Over the period in question the mean estimate of current inflation for those with a primary school education or lower is 16.1 per cent, while those with a third-level education or above estimate inflation at 10.6 per cent. Finally, it is interesting to note that of the work status categories, those working in home duties have the highest inflation perception, at 17 per cent. Assuming that the frequency of making purchases contributes to the formation of perceptions and that those in home duties do the majority of the household shopping, this finding can be considered quite surprising – housewives have the least accurate perception of price changes, at least in our data.

The reporting of averages masks other notable aspects of the data. The final column of Table 2 reports standard deviations of perceptions for each group and, as one might expect with a skewed distribution, there appears to be a relationship between the standard deviation and the mean. As suggested in the previous section, therefore, the differences between the groups may amount to more than the observation that some groups overestimate inflation by a greater amount.

There is also a clear tendency of the estimates towards salient values. Respondents are drawn towards round numbers, especially prominent ones, such that in the distribution of estimates there are "spikes" at round numbers and particularly those that are divisible by five. This is not uncommon. Bryan and Palmqvist (2005) report a similar finding for survey data on inflation expectations in the US and Sweden. Curtin (2005) finds "digit preference" in the Michigan survey data.[3] This is an important consideration when it comes to assessing the usefulness of the quantitative estimates and how best to model them. While the new question on the survey elicits greater useful variation between respondents and generates a more precise estimate of the misperception of inflation relative to its value as measured by the CPI, it also introduces a degree of measurement error resulting from a bias towards salient numbers.

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[3] See also Lindén (2006) using EU data and Malgarini (2008) using Italian data.

Table 2: *Inflation Perceptions by Demographic and Socio-economic group*

Year	2002*	2003	2004	2005	2006	2007	**Total**	**Std.Dev (2002-07)**
Male	12.9	12.4	10.1	9.7	10.1	9.0	**10.7**	**12.1**
Female	18.2	19.0	14.6	14.2	14.2	12.0	**15.4**	**16.3**
Primary	18.4	18.9	15.2	15.0	14.5	13.5	**16.1**	**17.7**
Junior Cert	16.7	17.4	14.1	14.1	13.8	11.6	**14.7**	**15.8**
Leaving/Other 2nd level	15.9	16.3	12.8	12.2	13.1	11.4	**13.7**	**14.7**
Third level	13.4	12.8	10.0	9.7	10.0	8.6	**10.6**	**11.7**
Working	14.6	14.6	11.8	11.1	11.7	9.9	**12.3**	**13.5**
Retired	14.5	14.9	10.8	11.0	10.8	10.9	**12.0**	**14.6**
Home Duties	20.3	21.2	16.0	15.7	15.0	12.8	**17.0**	**17.3**
Other	14.3	14.8	11.7	12.8	13.6	10.7	**13.0**	**14.8**
Married/Couple	16.1	16.1	12.4	12.3	12.5	10.6	**13.3**	**14.5**
Single etc.	14.8	15.4	12.6	11.5	11.9	10.8	**12.9**	**14.8**
16-29yrs	14.6	14.4	12.1	11.1	11.3	9.4	**12.4**	**13.7**
30-49 yrs	16.0	16.1	12.5	12.4	13.0	10.7	**13.4**	**14.3**
50-64 yrs	16.0	16.4	12.9	11.7	12.6	11.0	**13.4**	**15.2**
65+yrs	15.2	15.9	12.0	12.6	10.9	10.7	**12.8**	**15.3**
Income Quartile 1	16.8	19.6	14.9	14.4	13.5	13.6	**15.8**	**17.5**
Income Quartile 2	18.2	17.4	13.8	14.6	14.2	12.4	**14.9**	**16.3**
Income Quartile 3	16.9	15.5	12.4	12.6	13.7	11.3	**13.4**	**14.9**
Income Quartile 4	14.6	16.9	10.0	8.6	9.4	8.6	**11.2**	**12.1**
All	15.6	15.9	12.5	12.1	12.3	10.6	**13.2**	**14.6**
Mean CPI	4.6	3.5	2.2	2.4	3.9	5	**3.5**	**1.2**

* Six months from July

Lastly, it is worth noting that the distribution of inflation perceptions is subject to a strong right-skew, as shown in Figure 2. Perceived inflation in fact ranges from -70 per cent to 100 per cent, although these extreme estimates are a very small proportion of overall responses. The upper tail of the distribution is nevertheless quite long, 25.8 per cent of responses are over 20 per cent. In contrast, the lower tail of the distribution is truncated, with just 0.6 per cent of consumers perceive prices as having fallen. As indicated by the 25th and 75th percentile responses, half of

the respondents perceive inflation to be between 5 and 20 per cent. The mode of the distribution is 10 per cent, cited by 17.9 per cent of replies. Nearly 10 per cent perceived prices to be unchanged – a zero inflation rate. This is difficult to explain, as the official measure of inflation shows that since January 1990, inflation has ranged from 1 per cent to 7 per cent. It could be that these consumers perceive inflation to be very low and so round their estimate to zero.
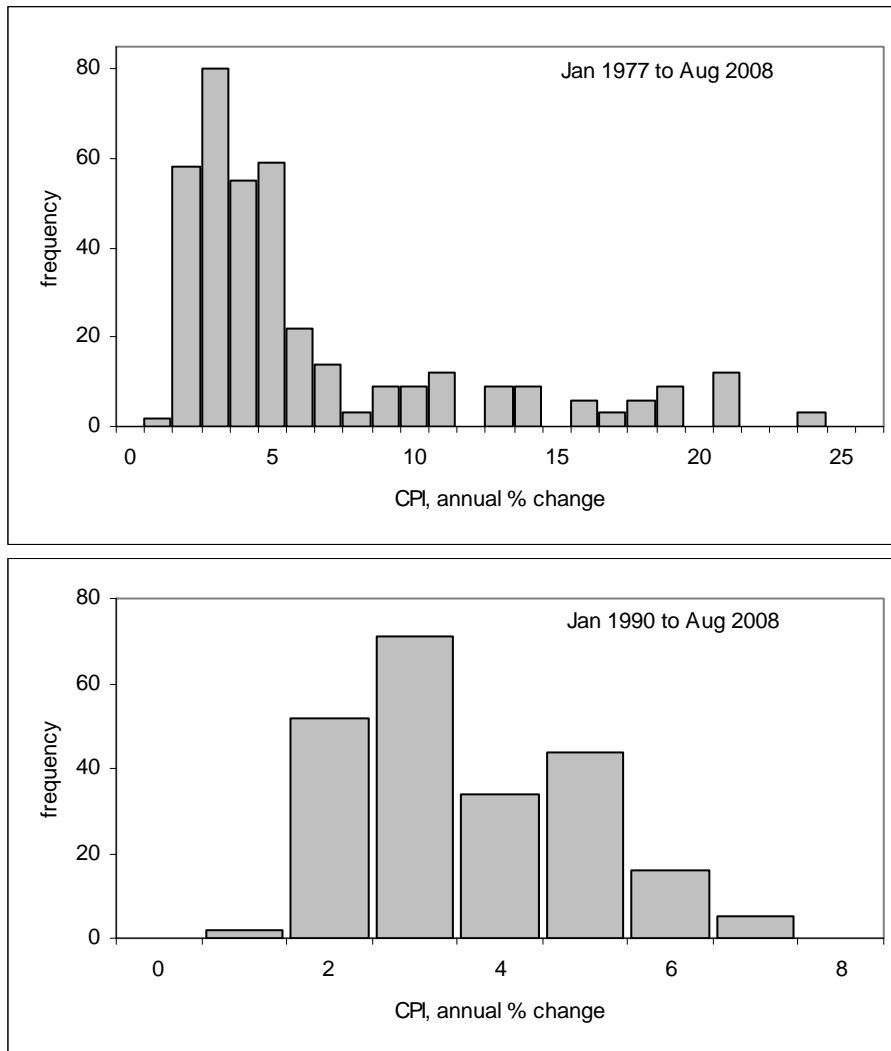
Figure 2: *Distribution of Consumer's Inflation Perceptions*
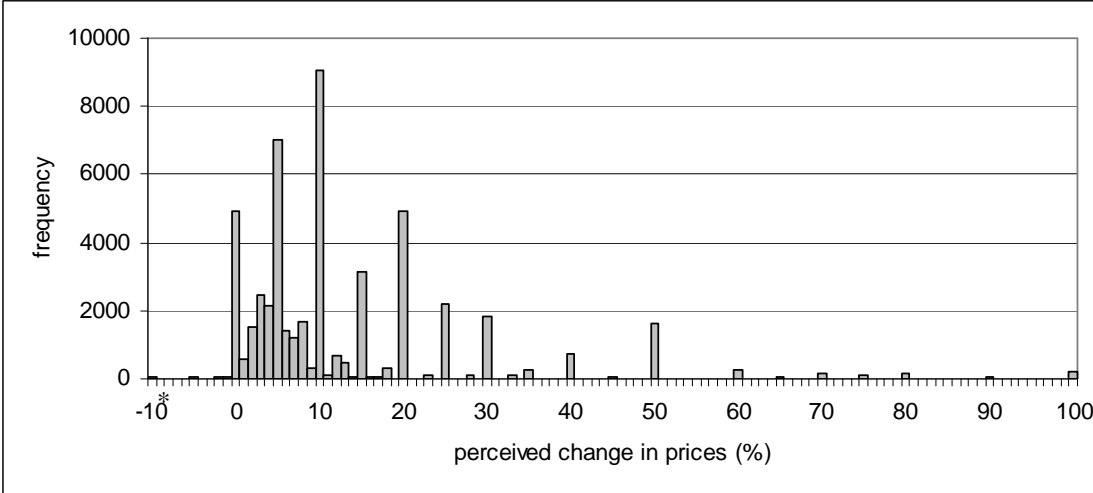
*A small proportion of inflation perceptions, 0.07 per cent, are less than -10 but are not included in the graph

It is worth asking what the historical distribution of the CPI looks like in reality, since one possible influence on perceptions is historical experience (Jonung, 1981) and there is some evidence over long time periods that inflation expectations display regression towards the historical mean (Thomas, 1999). The two panels of Figure 3 provide the distributions of the monthly CPI for Ireland for two time periods, January 1977 – August 2008 and January 1990 – August 2008. Hence, one can think of these distributions as representing the different inflation histories experienced by younger and older adults. It is notable that both distributions, like the distributions of estimates themselves, have a strong right skew.

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Figure 3: *Distribution of CPI for two time periods*

Given this, if consumers have any uncertainty about present inflation and employ history as a guide, it makes sense that their guess is generally higher than the prevailing CPI, since the mean of the historical distribution of the CPI is above its median. For our first period, 1977 to 2008, the difference between the mean and median is quite wide, with a mean of 5.9 and a median of 3.9. The gap narrows for the second period, 1990 to 2008, when the mean is 3.1 and the median is 2.8. Historical influences may therefore bias perceptions upwards. On the other hand, this analysis might lead one to put forward the hypothesis that older people's perceptions will have a stronger upward bias, which is neither confirmed in Table 2 nor in the multivariate that follows. Still, this skew in the distribution of the CPI itself remains a potential factor in the overestimation of inflation.

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4. Determinants of accurate inflation perceptions

The development of an appropriate multivariate model to explore the determinants of quantitative inflation perceptions is econometrically challenging. Malgarini (2008) employs ordinary least squares estimation, but we find such an approach results in highly non-spherical errors, as might be expected given the unusual nature of the distribution of individual estimates. We also explored the possibility of estimation via generalised least squares, but because the highly skewed error distribution is subject to extreme values in each tail, it does not conform easily to a known distribution. The alternative, which we adopt, is to categorise the quantitative estimates[4].

Once the estimates of perceived inflation are categorised, there remains a question regarding the appropriate model to use. Christensen, van Els and van Rooij (2006) employed ordered probit analysis after categorising quantitative inflation perceptions. As described Section 1, however, there is a confound between overestimation of perceived inflation and the accuracy of perception. It is hence questionable whether categories ranging from underestimation, through relatively accurate perception, to overestimation, are best considered as ordered categories for the purposes of examining what drives inflation perceptions. Rather than an ordered regression model, a non-ordered multinomial model may therefore be more appropriate.

Indeed, whether significant explanatory variables are better thought of as associated with higher estimates or less accurate estimates can be considered a testable hypothesis. We employ a multinomial logistic regression model in which the dependent variable has three categories: "underestimation" by more than 1 percentage point relative to the CPI; "accurate" estimation, within a band from 1 percentage point below to 2 percentage points above the CPI (inclusive); and "overestimation" by more than 2 percentage points[5]. The "accurate" category forms the

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[4] This approach can be criticised on the grounds that it throws away valuable variation and potentially results in the quantitative indicator of inflation perceptions, which was introduced to the survey in 2002, being no more analytically useful than the pre-existing qualitative one. However, using the categorical qualitative indicator as the dependent variable and employing the same model as is presented in this section produces a clearly inferior fit (including when the sample is limited only to respondents who were able to provide a quantitative estimate). Hence, although variation is discarded, the categories based on the quantitative indicator appear to be more systematically related to the explanatory variables than those arising from the qualitative indicator.

[5] We skew the band defining accurate perception in approximate accordance with the skew of the distribution of the monthly CPI, as described in Section 2. In fact, our results are largely insensitive to the definition of "accurate" and

reference for the dependent variable and we therefore present coefficients and odds ratios that estimate *separately* the association between the explanatory variables and the likelihood of underestimating or overestimating inflation. If a given explanatory variable, such as gender or socioeconomic status, is associated with higher perceived inflation, we would predict that the coefficient on that variable should be positive when comparing the likelihood of overestimation relative to accurate perception, but negative when comparing the likelihood of underestimation relative to accurate perception. If, instead, the given variable is associated with less accurate inflation perception, the coefficients for both sections of the model should have the same positive sign[6].

A broad range of standard background variables is available from the EU Consumer Survey for inclusion in the model: gender, age (7 categories), educational attainment (5 categories), income quartile, marital status (6 categories) and occupational class (8 categories). In addition, dummy variables for time (65 monthly dummies) are included in order to control for the effect of the Euro changeover (and other time specific effects). In line with the international evidence, the coefficients on the dummy variables display statistically significant variation over time that is consistent with the changeover having induced higher inflation perceptions. The coefficients for the likelihood of overestimation decrease with time, while for underestimation they increase (not shown).

The multinomial regression model is presented in Table 3. Coefficients and odds ratios relating to the likelihood of underestimating inflation are provided in the left-hand columns and those relating to overestimation are given in the right-hand columns. Consistent with previous findings, there is a strong and significant association between socioeconomic and sociodemographic characteristics and the perception of inflation. However, the pattern in Table 3 offers a substantially different interpretation to that suggested previously (Bryan and Venkatu, 2001a, 2001b; Christensen, van Els and van Rooij, 2006; Fluch and Stix, 2007; Malgarini, 2008).

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to this asymmetry. For example, the coefficients are very similar if the "accurate" category is defined as perceptions falling within 2 percentage points either side of the CPI, although the model is a marginally poorer fit.

[6] Although the category for perception exceeding the CPI by more than 2 percentage points includes over half the respondents who gave an estimate, our results are not sensitive to the number of dependent variable categories. Further categorisation of the overestimates into modest and larger values (between 2 and 5 percentage points and those higher still, or 2 and 10 percentage points and those higher still) does not alter the coefficients significantly. Hence, we report the more parsimonious three category model.

Considering first the likelihood of overestimation, women and those under the age of 50 are significantly more likely to perceive inflation to be well above the CPI. There are also strong effects of educational attainment and income, with those in lower socioeconomic groups more likely to overestimate. These coefficients are in keeping with previous findings. We also note, however, the role of marital status. Single people are less likely than married people to overestimate inflation. It is tempting to interpret this finding as relating to the increased likelihood that single people manage their own household finances, although other interpretations may be possible. The significant coefficient for cohabitees is consistent with this interpretation, since they are more likely to have recently been single. Lastly with respect to overestimation, higher occupational classes are less likely to perceive inflation well above the CPI, although the interesting exception to this is those in the "unskilled manual" category, who are also less likely to overestimate (relative to the "skilled manual" reference category). One possible reason for this could be the greater likelihood that people in this category receive benefit payments, the annual increments for which may focus attention on inflation. We unfortunately have no way to test this hypothesis with the present data and other interpretations are again possible.

Table 3: *Multinomial regression for accuracy of quantitative inflation estimate*

Dependent Variable Reference: Accurate (-1% < Error < 2%)	Underestimation (Error < -1%)		Overestimation (Error > 2%)	
	β (s.e.)	exp(β)	β (s.e.)	exp(β)
Intercept	-0.869***		0.347***	
	(0.141)		(0.106)	
Female	0.167***	1.182	0.498***	1.646
	(0.036)		(0.027)	
Age (40 – 49 years)				
16 - 19	0.079	1.083	-0.115	0.891
	(0.145)		(0.110)	
20 - 29	0.104	1.109	0.041	1.042
	(0.074)		(0.056)	
30 - 39	0.044	1.045	0.018	1.019
	(0.054)		(0.040)	
50 - 59	-0.092*	0.913	-0.206***	0.814
	(0.054)		(0.040)	
60 - 69	-0.085	0.918	-0.263***	0.769
	(0.074)		(0.057)	
70 plus	-0.092	0.912	-0.457***	0.633
	(0.064)		(0.049)	
Educational attainment (Third level)				
Primary	0.280***	1.323	0.417***	1.518
	(0.074)		(0.057)	
Lower second level	0.058	1.059	0.204***	1.226
	(0.060)		(0.046)	
Higher second level	0.105**	1.111	0.190***	1.210
	(0.050)		(0.038)	
Other second level	-0.090	0.914	0.003	1.003
	(0.063)		(0.046)	
Income (Top quartile)				
Bottom quartile	0.554***	1.740	0.657***	1.707
	(0.080)		(0.062)	
2nd quartile	0.416***	1.517	0.584***	1.792
	(0.058)		(0.044)	
3rd Quartile	0.261***	1.299	0.422***	1.525
	(0.045)		(0.034)	
Marital status (Married)				
Cohabiting	0.058	1.060	-0.190**	0.827
	(0.094)		(0.074)	
Separated	0.029	1.030	-0.112	0.894
	(0.107)		(0.082)*	
Widowed	0.135*	1.145	-0.105	0.900
	(0.076)		(0.060)	
Divorced	-0.079	0.924	-0.084	0.919
	(0.170)		(0.129)	
Never married	0.039	1.040	-0.199***	0.820
	(0.053)		(0.041)	
Occupational class (Skilled manual)				
Professional/Manager	-0.028	0.973	-0.171***	0.843
	(0.058)		(0.044)	
Non-manual	-0.061	0.941	-0.165***	0.847
	(0.059)		(0.045)	
Self-employed	0.255***	1.291	-0.002	0.998
	(0.067)		(0.052)	
Farmer	-0.076	0.927	0.015	1.015
	(0.083)		(0.062)	
Unskilled manual	-0.037	0.963	-0.170***	0.844
	(0.075)		(0.057)	
Never worked	-0.165	0.848	-0.255*	0.775
	(0.170)		(0.133)	
Other	-0.165	0.848	0.145	1.156
	(0.174)		(0.128)	
Monthly dummies	YES		YES	
N		41,500		
-2 Log Likelihood		55690.134		
Nagelkerke R-Squared		0.130		

* p < 0.1; ** p < 0.05; *** p < 0.01 (p-values for Wald test of $\beta_i = 0$)

Although different in certain nuances, the right hand columns of Table 3 look not unlike previous multivariate analyses of inflation perceptions. The left hand columns, however, represent a departure. If gender, age and socio-economic status drive the perception of inflation upwards, the coefficients for the likelihood of significant underestimation of inflation should be of the opposite sign to those for overestimation. They are not. Instead, it is clear that women and those of lower educational attainment and income, as well as being more likely to *overestimate* inflation, are also more likely to *underestimate* it. The coefficients for age also maintain their sign, although they are non-significant, as are the coefficients for marital status. Occupational status is also largely non-significant with respect to underestimation, although the self-employed appear to be particularly likely to underestimate inflation – a result we find hard to interpret.

The mean and variance of a skewed distribution are not independent. Hence, if there is reason for estimates of inflation to be skewed upwards across all social groups, then those groups with less accurate estimates will have higher mean estimates also. Thus, the results presented here suggest that the association between inflation perceptions and social groups is more subtle than previously thought. It is true that women, younger people and those in lower socioeconomic groups perceive, on average, prices to be rising faster than do men, older people and those in higher socioeconomic groups. However, in addition to being more inclined to overestimate inflation, these groups are also more inclined to underestimate it. Certain groups are perhaps not so much inclined to perceive higher inflation as to perceive it less accurately in a world where everyone tends to overestimate it.

5. Do misperceptions of inflation affect economic behaviour?

Although the misperception of inflation is systematic and sizeable, it is possible that it is ultimately of little economic significance. There is no guarantee that even large inaccuracies in the perception of price changes have an impact on ongoing household financial decisions. Meanwhile, people for whom knowledge of inflation might be particularly important, such as those involved in wage negotiations, may make the effort necessary to consult official figures when the need arises. The primary empirical issue is whether misperception of price changes has any systematic influence on economic decision-making.

We consider two explicit hypotheses for how misperceptions might affect behaviour. First, those who perceive inflation to be high might also perceive real interest rates to be low and may hence be less likely to save and more likely to borrow and spend. Second, it is also possible that individuals who perceive higher inflation at a given point in time also perceive poorer value for money. If this is the case, they may be less inclined to consume.

Naturally, we would ideally like to have data relating to individual economic decisions, such as actual consumption and saving levels or engagement with various financial services. Although falling short of this ideal, the EU Consumer Survey nevertheless contains two useful questions relating to attitudes, which ask about the advisability of buying and saving in the present economic climate, plus three questions relating to behavioural intentions, which ask about household spending plans over the next year, the intention to buy a car (within the next two years) and the intention to buy a house (within the next two years). While we cannot be sure that these indicators are related to subsequent behaviour, it is nevertheless a reasonable contention. Should there prove to be an association between the misperception of inflation and attitudes or behavioural intentions regarding consumption and saving, it would be consistent with the view that misperception of price changes has at least some economic consequences.

Dealing first with the attitudinal questions, the survey asks with respect to buying "large items of household equipment, such as furniture, washing machines, TV sets etc." whether "for people in general the present time is a good time to buy; neither a good time or a bad time; or a bad time to buy – the purchase should be postponed". Hence, the wording of the question makes clear that the answer carries behavioural advice about whether or not to make large purchases. We construct a binary variable from this question, assigning a 1 to respondents (25.5 per cent) who say it's a good time to buy and 0 to the rest. The question about saving simply asks whether, in view of the general economic situation, it is "a reasonable time to save". We assign the value 1 to respondents (65.7 per cent) who replied that it was "certainly" or "perhaps" a good time to save and 0 to those who said it was "probably not" or "certainly not" a good time to save.

We employ these two variables as dependent variables in logistic regression models, where the null hypothesis is that they will be unaffected by perceptions of inflation. Obviously, given the significant relationships uncovered in Section 3, it is important to control for relevant socio-

demographic and socioeconomic characteristics. We therefore include the same explanatory variables as for the previous multinomial model, as well as the monthly dummy variables. In addition, there may be other important variables not included as regressors that are related to perceptions of inflation and to the dependent variables. A particular concern in this regard is the respondent's general economic outlook. People who are pessimistic about the current economic climate may be more inclined to overstate inflation and to be negative about future prospects. Fortunately, the survey includes a five category variable for economic sentiment regarding the "general economic situation", ranging from "get a lot better" to "get a lot worse", which we include in the models.

Table 4 presents coefficients and odds ratios relating to inflation perceptions and optimism from logistic regression models for both attitudinal dependent variables[7]. Looking at the left hand model, people who overestimate inflation are substantially and significantly less likely to believe that large household purchases should be made, while those who underestimate it are less likely to believe this. People who overestimate by more than 10 percentage points are only 71 per cent as likely as individuals with accurate perceptions to believe that it is a good time to buy. The coefficients on the control variables for economic sentiment are also highly significant. Turning to the right hand model, overestimation of inflation is also significant for attitudes towards saving, with those who overestimate inflation being less inclined to think it is a good time to save.

One could argue that these models present a somewhat contradictory picture, since overestimation of inflation is associated with negative attitudes to both consumption and saving, while money must be either spent or saved. However, it must be borne in mind that these questions are about attitudes. It is not contradictory to believe both that inflation is such that it is likely to erode savings (that the real interest rate is low) and that prices currently represent poor value for money. It is simply that the behavioural consequences of these attitudes, assuming that there do exist links with behaviour, are in opposition to one another and will to some degree, therefore, balance each other out. The net effect on decision-making with respect to levels of

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[7] For ease of explanation, full models including coefficients for all regressors are not shown here, but are available from the authors on request.

consumption and saving we cannot know. Nevertheless, misperceptions of inflation clearly are associated with relevant attitudes.

Table 4: *Logistic regression for attitudes to consumption and saving*

	Good time to buy		Good time to save	
	β (s.e.)	exp(β)	β (s.e.)	exp(β)
Sociodemographic controls				
Gender, Age, Marital status	YES		YES	
Socioeconomic controls				
Educational attainment, income, occupational class, age-gender interactions, age-marital status interactions	YES		YES	
Inflation perception (Accurate)				
Underestimate (>1 % pts. below CPI)	0.161*** (0.029)	1.175	-0.067* (0.036)	0.936
Modest overestimate (>2 % pts. above CPI)	-0.078** (0.029)	0.925	-0.148*** (0.030)	0.863
Large overestimate (>10% pts. Above CPI)	-0.347*** (0.031)	0.707	-0.405*** (0.030)	0.667
General economic sentiment (stay the same)				
Get a lot better	0.747*** (0.072)	2.110	0.093 (0.080)	1.097
Get a little better	0.304*** (0.027)	1.355	0.151*** (0.029)	1.163
Get a little worse	-0.163*** (0.025)	0.849	-0.170*** (0.024)	0.843
Get a lot worse	-0.493*** (0.044)	0.611	-0.615*** (0.035)	0.541
Monthly dummies	YES		YES	
N	50,570		50,570	
-2 Log Likelihood	57106.596		61313.739	
Nagelkerke R-Squared	0.064		0.057	
Hosmer Lemeshow Test (p-value)	0.036		0.500	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ (p-values for Wald test of $\beta_i = 0$)

The three answers to survey questions on behavioural intentions are similarly recoded as binary responses and employed as dependent variables in logistic regression models. For the first model, we assign the value 1 to respondents (30.6 per cent) who said they were planning to spend less on household items over the next 12 months, the value 0 to those planning to spend the same or more. Two more variables for the intention to buy a car and a house are constructed such that those respondents who stated that they would "perhaps" or "certainly" buy a car (house) over the next two years are given the value 1 (34.7 per cent for car purchase, 18.9 per cent for house purchase), otherwise the value 0.

Rather than asking respondents about how people generally ought to take economic decisions at the time of the interview, the questions used to construct these dependent variables ask

specifically about the behaviour of the respondent's household over the coming period. Hence, in addition to concerns mentioned above about the influence of general economic optimism on the response, we also control for the individual's level of optimism and pessimism with respect to their own household. An extra categorical control variable is added that measures sentiment regarding the outlook specifically for the household's finances.

Coefficients from the three logistic regression models are provided in Table 5, in similar fashion to Table 4. For household spending, there is a consistent gradient across the inflation perception categories. Those who underestimate inflation are less likely to state an intention to rein in spending than those who perceive inflation accurately, while those who overestimate it are more likely to state the intention to do so, especially if they overestimate inflation by more than 10 percentage points. In the second model, overestimating inflation has a substantial and significant association with the intention to buy a car – those perceiving high inflation are less inclined to buy. In both cases, levels of general economic and personal financial sentiment are significant.

We suggest that these two models of consumption intentions, relating to household spending and car purchase, while controlling for general and personal economic outlook, constitute evidence that the misperception of inflation is likely to affect individual economic decision-making. They are consistent with the hypothesis that individuals who perceive inflation to be higher also perceive less value for money from consumption. If the stronger influence of inflation misperception on behaviour were via perceptions of real interest rates, one might expect intention to purchase a car, in particular, to be positively related to overestimation.

Table 5: *Logistic regression for behavioural intentions regarding household spending, car purchases and house*

	Cut household spending		Buy car in next 2 years		Buy house in next 2 years	
	β (s.e.)	exp(β)	β (s.e.)	exp(β)	β (s.e.)	exp(β)
Sociodemographic controls						
Gender, Age, Marital status	YES		YES		YES	
Socioeconomic controls						
Educational attainment, income, occupational class, age-gender interactions, gender-marital status interactions	YES		YES		YES	
Inflation perception (Accurate)						
Underestimate (>1 % pts. below CPI)	-0.167*** (0.038)	0.847	-0.038 (0.034)	0.962	0.030 (0.051)	1.031
Modest overestimate (>2 % pts. above CPI)	0.059* (0.030)	1.061	-0.055* (0.028)	0.946	0.042 (0.041)	1.043
Large overestimate (>10% pts. Above CPI)	0.198*** (0.031)	1.219	-0.156*** (0.029)	0.855	-0.011 (0.044)	0.989
General economic pessimism (Stay the same)						
Get a lot better	0.072 (0.082)	1.074	0.275*** (0.077)	1.317	0.431*** (0.102)	1.539
Get a little better	-0.122*** (0.030)	0.885	0.114*** (0.027)	1.121	0.141*** (0.040)	1.152
Get a little worse	0.043* (0.025)	1.044	-0.021 (0.024)	0.979	0.014 (0.036)	1.014
Get a lot worse	0.314*** (0.037)	1.369	-0.082** (0.038)	0.921	0.026 (0.059)	1.026
Personal financial pessimism (Stay the same)						
Get a lot better	-0.123 (0.097)	0.884	0.425*** (0.084)	1.529	0.875*** (0.092)	2.400
Get a little better	-0.095** (0.030)	0.909	0.221*** (0.026)	1.247	0.272*** (0.036)	1.312
Get a little worse	0.252*** (0.026)	1.287	-0.207*** (0.026)	0.813	-0.040 (0.041)	0.961
Get a lot worse	0.572*** (0.054)	1.772	-0.490*** (0.064)	0.613	-0.129 (0.100)	0.879
Monthly dummies	YES		YES		YES	
N	50,570		50,570		50,570	
-2 Log Likelihood	57552.675		61638.760		32815.826	
Nagelkerke R-Squared	0.037		0.132		0.164	
Hosmer Lemeshow Test (p-value)	0.385		0.092		0.281	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ (p-values for Wald test of $\beta_i = 0$)

The third model in Table 5 makes us more inclined to conclude that misperception is likely to affect behaviour. Intention to buy a house is not significantly associated with inflation perceptions, although like the other dependent variables described in this section it is strongly associated with economic optimism. We believe this result makes sense: households understand that the factors affecting house prices are different from those affecting prices generally. Furthermore, if our variable for inflation perceptions were acting as a proxy for some other form of economic confidence, one not controlled for by our variables for general and personal

optimism, we would anticipate that it would show up as significant in this third model. Its insignificance therefore reinforces our contention that the associations between inflation misperceptions, attitudes and intended behaviour, are meaningful.

Still, although the effects we report here are highly statistically significant, some caution is appropriate. The diagnostic statistics (Tables 4 and 5, bottom two rows) suggest that the models are of varying goodness-of-fit and there are doubtless many omitted factors relating to personal circumstances, need and opportunities that are important. In principle, any omitted variable that is related to both the perception of price increases and the dependent variable in question could bias our coefficients on the inflation perception categories. For instance, it could be argued that those who perceive inflation accurately are more financially literate and so more likely to state intentions with confidence. The failure to find a significant effect of misperceptions on house prices again offers a degree of reassurance here. Yet it could also be argued that, at least in some of the models, causality might run in the opposite direction to that suggested, e.g. someone who intends to buy a car in the near future might conceivably keep a closer eye on prices than someone who does not (Lindén, 2005).

Nevertheless, the pattern across the models is highly significant and consistent with the idea that perceptions of price rises have a systematic impact on economic behaviour in a manner that is easily explicable by the association of high inflation with poor value for money and erosion of nominal income and wealth. We consider it likely, therefore, that the misperception of inflation by Irish consumers has consequences for individuals and the wider economy.

6. Discussion

The present analysis confirms that inflation perceptions in Ireland display the same empirical pattern as has been observed elsewhere. Inflation is, on average, substantially overestimated – more so in the years immediately following the Euro cash changeover. Furthermore, there is a wide dispersion of perceptions, containing both overestimates and underestimates, with less than 15 per cent of the population perceiving inflation to be within 2 percentage points of the contemporaneous figure for the CPI. Women and those in lower socioeconomic groups perceive inflation to be higher, on average.

Our empirical analysis cannot distinguish between most of the various hypotheses put forward to explain the overestimation of inflation. The direction of the relationship between age and perceptions does suggest that there is more to the phenomenon than a bias in the direction of previous experience, e.g. whether one lived through the 1970s. The finding that women and those in lower socio-economic groups are more likely to underestimate as well as to overestimate inflation, adds to the evidence that misperceptions are not simply a function of consumers' different experiences of real price rises – a theory that in any case struggles to cope with the consistency of misperceptions across nations and over time, as outlined in Section 2. More likely, then, is that psychological biases come into play, be it the salience of specific price changes, loss aversion or biased memory for past prices.

However, our results provide a new perspective on the different inflation perceptions of social groups. The findings suggest that whatever forces underlie the overestimation of price rises across the population as a whole may not be behind the differences recorded between social groups. It seems more likely that there are reasons why consumers generally overstate inflation, which apply across all social groups, and that women and those in lower socioeconomic groups simply perceive inflation less accurately while being subject to the same upward bias.

This perspective suggests that concerns about variability in financial literacy across social groups (e.g. Braunstein and Welch, 2002; de Meza, Irlenbusch and Reyniers, 2008) are not misplaced. Moreover, the evidence that misperceptions are associated with both attitudes to consumption and saving, and intentions with respect to the economic behaviour of the household over the coming year, can only add to this concern. Many people misperceive inflation substantially and it seems that this misperception may well influence their economic decision-making.

The empirical investigation of inflation expectations and perceptions began in earnest following the rational expectations revolution. At least for the wider population, it is very difficult to reconcile the systematic misperception of inflation with the rational expectations approach. Of course, it may be the case that the minority of people involved in decisions of greater importance to the macroeconomy, such as wage negotiators, major lenders and big borrowers, are the same minority of people who perceive inflation accurately. A positive relationship between accuracy

of perception and its importance for the specific decisions faced by the individual concerned would be in line with the principles of bounded rationality.

Nevertheless, we think it very likely, given the results above, that a substantial proportion of consumer decision-making does not take inflation into account as the assumption of economic rationality, bounded or otherwise, suggests it should. Very many people substantially misperceive price rises, in an environment where the costs of obtaining accurate information about the CPI are very small. Furthermore, their misperception appears to have consequences, in that it is linked to attitudes and intentions with respect to economic behaviour and, hence, is likely to affect behaviour itself.

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