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Inflation Expectations and Readiness to Spend: Cross-Sectional Evidence†

By RÜDIGER BACHMANN, TIM O. BERG, AND ERIC R. SIMS*

There have been suggestions for monetary policy to engineer higher inflation expectations to stimulate spending. We examine the relationship between expected inflation and spending attitudes using the microdata from the Michigan Survey of Consumers. The impact of higher inflation expectations on the reported readiness to spend on durables is generally small, outside the zero lower bound, often statistically insignificant, and inside of it typically significantly negative. In our baseline specification, a one percentage point increase in expected inflation during the recent zero lower bound period reduces households' probability of having a positive attitude towards spending by about 0.5 percentage points. (*JEL* D12, D84, E21, E31, E52)

There have recently been suggestions by economists and policymakers alike to engineer higher private sector inflation expectations with the goal of stimulating current spending.[1] Increased inflation expectations might lower real interest rates and thus boost interest-sensitive components of aggregate demand, particularly in an environment in which nominal interest rates are constrained from below.

*Bachmann: Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen University, Center for Economic Policy Research (CEPR), Center for Economic Studies and the Information and Forschung Institute (CESifo), and Information and Forschung (Ifo) Institute, Templergraben 64, Rm. 513, 52062 Aachen, Germany (e-mail: ruediger.bachmann@rwth-aachen.de); Berg: Ifo Institute, Ifo Center for Business Cycle Analysis and Surveys, Poschingerstrasse 5, 81679 Munich, Germany (e-mail: berg@ifo.de); Sims: University of Notre Dame, National Bureau of Economic Research (NBER), and Ifo Institute, 710 Flanner Hall, Notre Dame, IN 46556 (e-mail: esims1@nd.edu). We are grateful to conference/seminar participants at the 2012 Allied Social Science Association (ASSA) meeting in Chicago, the 2013 ASSA meeting in San Diego, the 2011 Ifo Conference on "Macroeconomic and Survey Data," the NBER Monetary Economics group, the Strengthening Efficiency and Competitiveness in the European Knowledge Economics (SEEK)/CEPR Workshop on "News, Sentiment, and Confidence in Fluctuations," the European Central Bank, the Federal Reserve Banks of Boston, Cleveland, and New York, the Ifo Institute, the University of Maryland, the University of Notre Dame, the University of Texas at Austin, and Western Michigan University for useful suggestions. We are particularly grateful to Olivier Coibion and William Branch for helpful discussions, as well as to Mike Pries and several anonymous referees for insightful comments. We also thank Rebecca McBee from the Institute for Social Research for some help with the data, as well as Annika Klatt for her excellent research assistance. The usual disclaimer applies.

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[1] Ken Rogoff (in Ydstie 2011): "They need to be willing, in fact actively pursue, letting inflation rise a bit more. That would encourage consumption. It would encourage investment"; Naryana Kocherlakota (in WSJ.com 2010): "To a limited extent, this should be a good thing in some sense, to have more expected inflation"; and Christina Romer (in *New York Times* 2011): "In the current situation, where nominal interest rates are constrained because they can't go below zero, a small increase in expected inflation could be helpful. It would lower real borrowing costs, and encourage spending on big-ticket items like cars, homes, and business equipment." See also Romer (2013) for a reiteration and elaboration of this idea.

Increased inflation expectations also mean expected wealth gains for debtors. To the extent that debtors have on average higher propensities to spend out of wealth than creditors, increased inflation expectations might lead to higher current aggregate spending.[2] There are, however, other economic channels that make the sign of the relationship between expected inflation and spending theoretically ambiguous. Inflation is a tax on the holders of highly liquid assets and hence may function as a tax on economic activity, to the extent to which these assets are used as a medium of exchange.[3] Higher expected inflation may also be viewed as a sign of incertitude on the part of policymakers, signaling bad times ahead.[4]

The objective of this paper is to provide some econometric evidence on both the sign and the magnitude of the relationship between inflation expectations and spending. We do so using microlevel cross-sectional data on individual inflation expectations and spending attitudes from the Michigan Survey of Consumers. Using cross-sectional data to study the relationship between expected inflation and spending has at least four advantages over studying aggregate data. First, by eliciting inflation expectations and spending readiness from the same person they help us identify the link between inflation expectations and spending at the level of actual decision makers. Second, cross-sectional variation allows us to study whether the relationship between inflation expectations and spending is different at the zero lower bound compared to normal times, as many standard models suggest. Given that in US post-war history zero lower bound regimes have been rare occurrences (they are in point of fact a singular event), it is difficult with only aggregate data to investigate empirically the link between inflation expectations and the readiness to spend at very low nominal policy interest rates. Third, the average expected inflation rate and aggregate spending are presumably determined simultaneously, making it difficult to isolate the causal relationship between one and the other. Microdata, in contrast, is less likely to be fraught with this simultaneity issue, as cross-sectional variation in individual spending decisions should not have an impact on the evolution of aggregate prices. Fourth, cross-sectional data allow us to study potentially interesting heterogeneities in the nexus between inflation expectations and spending.

The Michigan Survey of Consumers collects cross-sectional data on quantitative inflation expectations over one-year horizons and five- to ten-year horizons and qualitative measures of spending attitudes. The latter are gathered from the responses to qualitative questions about whether it is a good or bad time to buy a variety of goods, such as durable household items, cars, and houses. We will frequently refer to these questions as measuring "readiness to spend."[5]

Given the discrete and qualitative nature of many of the survey questions at the micro level, to analyze the data formally we employ ordered probit models to investigate the relationship between expected inflation and readiness to spend. This empirical

[2] Doepke and Schneider (2006) provide an empirical investigation of this channel.

[3] Aruoba and Schorfheide (2011) study this channel quantitatively and find it to be important.

[4] Volcker (2011) and Taylor (in Ydstie 2011) have expressed this view informally.

[5] In a very recent working paper, Burke and Ozdagli (2013), take up the question we have been posing in this paper, and use a panel dataset from the New York Fed with both quantitative inflation expectations and spending decisions, which, however, covers only a short and recent period of time and that has now been discontinued, and find results for durable goods spending similar to ours.

specification allows us to estimate the effect of increased inflation expectations on the probability of answering that it is a good time to spend. We also control for a number of aggregate and idiosyncratic factors. These controls are meant to ensure that the identifying variation in expected inflation is unrelated to other factors which impact spending attitudes. Our econometric model also allows for state-dependence so as to investigate whether the link between inflation expectations and the reported readiness to spend is different at the zero lower bound compared to normal times.

Overall, we find that the impact of inflation expectations on the reported readiness to spend on durables is small, outside the recent zero lower bound episode often statistically insignificant, and inside of it typically significantly negative. In the baseline estimate, which makes use of the whole cross-section, a one percentage point increase in expected inflation during the recent zero lower bound episode is associated with a reduction in households' probability of having a positive attitude towards spending by about 0.5 percentage points. These basic results for inflation expectations obtain in a variety of different robustness checks and specifications. In contrast, the current financial situation of the household, its expectations about business and labor market conditions in the future, or its trust in economic policy have much larger and significantly positive impacts on household attitudes towards spending on durables.

How should one interpret our reduced-form results? In what sense can they matter for the conduct of monetary (or fiscal) stabilization policy? We show that the small, essentially zero effect of inflation expectations on spending persists across most age groups, birth cohorts, education levels, and income quintiles. This relationship is also rather stable over time. These findings together at least suggest that the reduced-form relationship between inflation expectations and spending we uncover is somewhat structural, and tell a cautionary tale for policies designed to engineer inflation expectations in order to generate greater spending.

The one group for which there does exist a positive relationship between expected inflation and spending attitudes is those households which are "good" inflation forecasters, in a sense to be formalized below. Presumably, households that are "good" forecasters are well-informed and follow macroeconomic developments closely. Based on the Michigan Survey, however, they represent only a relatively small fraction of total households, and there is little to suggest that they account for a disproportionate share of aggregate expenditure. Therefore, at the very least, our results suggest that policymakers would likely face a difficult communication and education challenge when advocating inflationary policies.

Our empirical work fits into a growing literature which focuses on the role of expected inflation in stabilization policy. For the case of monetary policy, Krugman (1998), Eggertson and Woodford (2003), and Eggertson (2006) have advocated for central banks to promise higher future inflation as a means of expansionary policy during periods in which nominal interest rates have hit their lower bound. For the case of fiscal policy, Eggertson (2011); Christiano, Eichenbaum, and Rebelo (2011); and Woodford (2011) show in standard New Keynesian models that the government spending multiplier may be large when the zero lower bound for nominal interest rates binds, where the extra stimulus obtains due to the interaction between inflation expectations and the real interest rate. Eggertson (2008) argues that it was a mix of fiscal and monetary policies designed to generate inflation expectations that led

to the recovery from the Great Depression, while Romer and Romer (2013) argue that it was monetary-policy-induced deflation expectations that caused the Great Depression in the first place. Farmer (2012) claims that the recent unconventional monetary policy operations have kept inflation expectations up and that this constitutes successful stabilization policy.

Economic theory is nevertheless not clear in suggesting that higher expected inflation must lead to more spending. Indeed, economists like Edward Leamer (in Leamer 2011) have polemicized against using inflation expectations as a tool for stabilization policy. Paul Volcker (in Volcker 2011) and John Taylor (in Ydstie 2011) view the engineering of higher inflation expectations as dangerous and, ultimately, as a sign of incertitude on the part of policymakers that portends bad times ahead; a related idea has recently been formalized in an imperfect information model by Maćkowiak and Wiederholt (2012b). Inflation functions as a tax on the holders of cash and other highly liquid assets, and hence might be a tax on economic activity, so higher expected inflation might depress spending by functioning like a tax. In environments with pervasive nominal wage rigidities, higher inflation might result in wealth losses for households. Also, to the extent that higher inflation expectations are driven partially by higher gas price expectations, they might constitute negative wealth shocks. Finally, calls for promising higher future inflation to stimulate spending rest on the presumption that consumer spending reacts strongly to fluctuations in real interest rates. However, Maćkowiak and Wiederholt (2012a) and Gabaix (2012) argue that, in boundedly rational environments, economic decisionmakers may not pay much attention to real interest rates.

On the empirical front, there is an older literature that investigates the relationship between consumer spending and inflation/inflation expectations. Using aggregate time series data on spending and inflation expectations, Juster and Wachtel (1972) find that higher inflation expectations lead to lower durable goods spending, and Burch and Werneke (1975) find that higher expected inflation is associated with increases in the national saving rate. They interpret their results through a similar policy-confidence lens as Paul Volcker and John Taylor.

More recently, Wieland (2014) documents that temporary negative supply shocks are contractionary during episodes of low policy interest rates. These negative supply shocks raise expected inflation but, by their temporary nature, have limited wealth effects. The standard Fisher relationship logic of most New Keynesian models predicts that these shocks should be expansionary at the zero lower bound because they work to lower real interest rates. Wieland's (2014) results (and ours) potentially point to some failure of the basic Fisherian logic which is present in most modern macro models. He attributes his findings to a decline in asset prices, a decline in net worth, and financial frictions. Our results point to another potential explanation: nominal interest rate illusion. We find that spending attitudes are significantly negatively impacted by expected movements in nominal interest rates. That expected inflation has very little effect on spending attitudes perhaps suggests that a majority of households may not understand the distinction between nominal and real rates of interest.

Ours is one of only a few papers to have made use of the underlying microdata of the Michigan Survey. Souleles (2004) uses these data to test the rationality of individual forecasts. Coibion and Gorodnichenko (2012) use the micro level inflation forecasts

to examine how disagreement about inflation reacts to different shocks as a test of competing models of informational rigidities. Their line of research—informational frictions—also presents a theoretical justification of the existence and persistence of cross-sectional heterogeneity in inflation expectations, which we exploit in this paper. Malmendier and Nagel (2013) use the inflation expectation questions to study how inflation expectation formation is governed by the actual inflation experiences that various cohorts have gone through. A recent paper by Carvalho and Nechio (2014) uses the Michigan Survey data to test whether agents understand Taylor rules. Finally, Dräger and Lamla (2013) use the Michigan inflation expectation data to study the anchoring of inflation expectations both in the cross-section and over time.

The remainder of this paper is organized as follows: Section I sketches a formal framework for the empirical investigation. Section II describes the microdata. Section III explains the ordered probit empirical design and Section IV presents the results for household durables. Section V concludes. An online Appendix provides detailed information on the survey questions used in the paper, more raw data analysis, and the estimation results for cars and houses.

I. Expenditure on Durables and Inflation: Theory

Many who call for higher expected inflation to stimulate spending base their logic on two assumptions: first, that expenditure is inversely related to the real interest rate; and second, that higher expected inflation lowers the real interest rate, holding the nominal rate fixed. The former is typically motivated via an Euler equation, while the latter results from the Fisher relationship that the real rate (approximately) equals the nominal rate less expected inflation. The conventional Euler equation argument is based on nondurable consumption. As our focus is on durable consumption expenditures, below we briefly sketch some theory to relate the level of inflation to durable expenditures in an optimizing framework.

Suppose that a household receives flow utility from nondurable consumption, C_t, and a stock of durable goods, X_t: $U(C_t, X_t)$. The flow utility function has standard properties, and the future is discounted by the factor $0 < \beta < 1$. The household receives a flow of real income each period, Y_t, and enters the period with a stock of nominal financial assets, A_t, which offer gross return R_t. Let P_t denote the nominal price of goods. The stock of durables depreciates at rate $0 < \delta < 1$. The flow budget constraint is:

$$P_t C_t + A_{t+1} + P_t(X_t - X_{t-1}) + \delta P_t X_t \leq P_t Y_t + R_t A_t. \tag{1}$$

For ease of exposition, we assume that there is no uncertainty. Letting λ_t denote the Lagrange multiplier on the constraint, the first order conditions with respect to the optimal choices of C_t, A_{t+1}, and X_t are, respectively:

$$\beta^t U_C(C_t, X_t) = \lambda_t P_t \tag{2}$$

$$\lambda_t = \lambda_{t+1} R_{t+1} \tag{3}$$

$$\beta^t U_X(C_t, X_t) = P_t\lambda_t - P_{t+1}\lambda_{t+1}(1-\delta). \tag{4}$$

Defining $\Pi_t \equiv \frac{P_t}{P_{t-1}}$ as the gross inflation rate, with $\frac{R_{t+1}}{\Pi_{t+1}}$ being the standard Fisher relationship relating the nominal return and expected inflation to the real return, the multiplier can be eliminated:

$$U_C(C_t, X_t) = \beta U_C(C_{t+1}, X_{t+1})\frac{R_{t+1}}{\Pi_{t+1}} \tag{5}$$

$$U_X(C_t, X_t) = \beta U_C(C_{t+1}, X_{t+1})\left(\frac{R_{t+1}}{\Pi_{t+1}} - (1-\delta)\right). \tag{6}$$

The first expression is the familiar Euler equation for nondurable consumption, while the second is an Euler equation governing the tradeoff between durables and nondurables. Suppose that shocks are sufficiently short-lived so that the future marginal utility from nondurables can be treated as fixed. This means that, holding the nominal return, R_{t+1}, fixed, an increase in inflation between t and $t+1$, Π_{t+1}, lowers the real return. This means that both nondurable consumption and expenditure on durables should increase. Furthermore, one can combine the Euler equations to get:

$$\frac{U_X(C_t, X_t)}{U_C(C_t, X_t)} = \left(1 - (1-\delta)\frac{\Pi_{t+1}}{R_{t+1}}\right). \tag{7}$$

From this expression, one sees that an increase in Π_{t+1} must lower $\frac{U_X(C_t, X_t)}{U_C(C_t, X_t)}$. Under certain assumptions on preferences (for example, a log-log-specification), this would imply an increase in $\frac{X_t}{C_t}$. This means that an increase in anticipated inflation, holding the nominal return fixed, would not only lead to an increase in both nondurable and durable consumption, but it would also result in a relative increase in durable to nondurable expenditures. Put differently, durable consumption expenditures would be more interest sensitive than nondurables. This is consistent with Christina Romer's statement in footnote 1 as well as earlier empirical findings in the literature, e.g., Hamburger (1967) and Mankiw (1983). Because inflation affects the real interest rate through the Fisher relationship, this framework shows that durables are in fact the most suitable expenditure category for our research inquiry.

II. Data Description and Analysis

This section provides a detailed description of the inflation expectations and buying attitudes data from the Michigan Survey of Consumers.

A. *Data Sources*

We use the underlying microdata from the Survey of Consumers conducted by the Survey Research Center at the University of Michigan. These data are available at a monthly frequency and cover (depending on the empirical specification, at most) the period 1984:1 to 2012:12.[6] Each month, about 500 interviews are carried out via random telephone dial and the samples are designed to be representative of all American households. There is a rotating panel component to the survey, where each month about 60 percent of interviews are first time respondents while 40 percent are households who were interviewed six months prior. In our baseline we will focus on first time interviews, which allows us to treat the data as coming from repeated cross-sections, though we will make use of the panel aspect of the survey in some robustness checks in Section IV.

We focus on the following two questions in our baseline scenario:[7]

Q1: *"About the big things people buy for their homes—such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or a bad time for people to buy major household items?"*

Q2: *"By about what percent do you expect future prices to go (up/down) on the average, during the* next *12 months?"*

Responses to (Q1) take on three different qualitative categories: good, bad, and neutral, while the responses to (Q2) are quantitative and expressed in percentage points. The survey only asks about spending conditions for durables, not about nondurables and services. While durables are usually a relatively small part of the current spending budget of households, they are also the most sensitive to both idiosyncratic and aggregate economic conditions, especially interest rates (see the argument in Section I).

While we believe that one-year ahead inflation expectations cover the right time horizon for smaller household consumer durables and are also more precisely answered by survey participants, we include, as a robustness check, specifications with five- to ten-years ahead inflation expectations that the survey started to ask about in 1990.

Q3: *"By about what percent* per year *do you expect prices to go (up/down) on the average, during the* next *5 to 10 years?"*

As an alternative to consumer durables, we also consider questions about the readiness to buy cars and houses, the results of which are presented in the online Appendix to this paper.

[6] Part of the publicly available dataset goes back to 1978, but we focus on this particular subsample in order to avoid a possible structural break in the conduct of monetary policy during the Volcker era.

[7] A18 and A12b, respectively, of the Survey of Consumers.

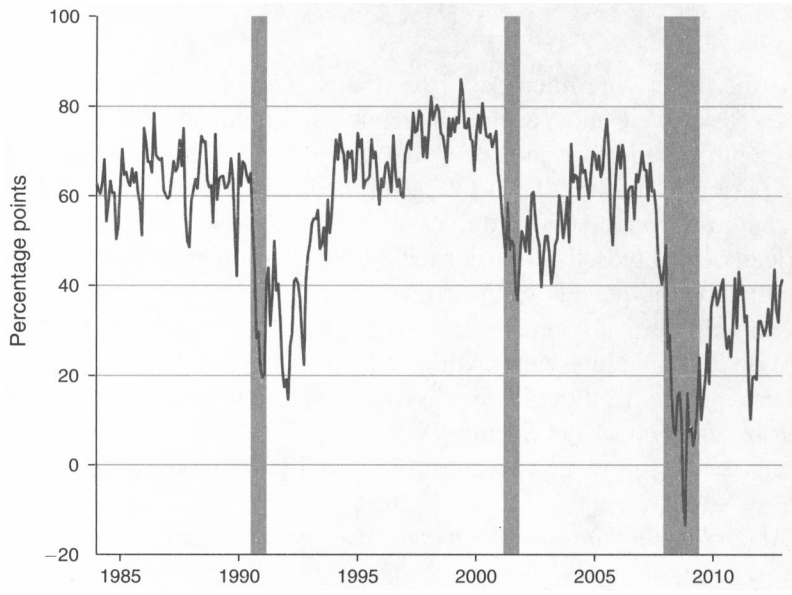

FIGURE 1. BUYING CONDITIONS FOR DURABLE GOODS–AGGREGATE INDEX

Notes: This figure shows the monthly time series of the fraction of people saying that now is a good time to buy durable goods minus those responding that now is a bad time to buy (solid line) together with US recessions as dated by the NBER (gray shaded area). This aggregate index is based on (Q1). We have removed from the sample all month-household observations with inflation expectation observations that are larger than 20 percent in absolute value. The sample period is 1984:1 to 2012:12.

In addition to those listed above, the Michigan Survey asks several other questions about expectations for both idiosyncratic and aggregate economic outcomes. Among these are questions about the expected change in the household's financial situation over the next year (Q4), the expected change in household real income (Q5), expected movements in nominal interest rates (Q6), expected overall aggregate business conditions over both a twelve month (Q7) and a five-year horizon (Q8), the expected movement in the aggregate unemployment rate (Q9), and assessments of the overall economic policy of the government (Q12). The exact wording of these questions is presented in the Appendix. Similar to the buying conditions questions, responses to these questions are generally coded into three qualitative categories: good/up, indifferent/no change, or bad/down. The survey also contains fairly rich demographic information on the respondents, including information on sex, age, race, education, marital status, household size, geographic location, income, and homeownership status.

B. *Basic Data Analysis*

In this subsection we present summary statistics on both the buying conditions and inflation expectations questions. For this and all subsequent exercises in the paper, we omit all month-household observations with inflation expectation observations that are larger than 20 percent in absolute value to ensure that our results are not affected by extreme outliers. Figure 1 plots the relative score for (Q1), defined as

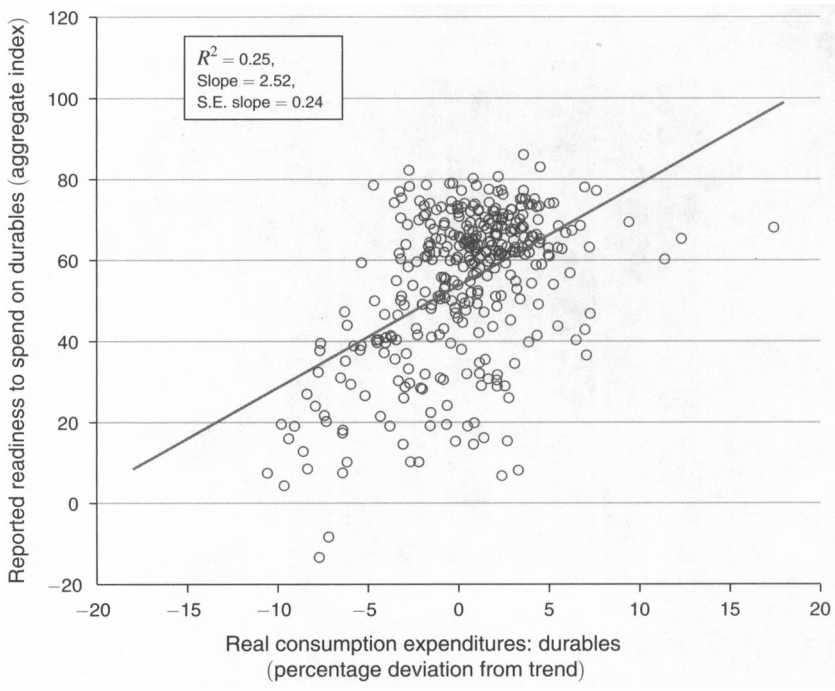

FIGURE 2. RELATIONSHIP BETWEEN AGGREGATE ACTUAL CONSUMPTION EXPENDITURES ON DURABLES AND THE REPORTED READINESS TO BUY DURABLES

Notes: This figure shows a scatter plot between the reported readiness to spend on durables (aggregate index, see notes to Figure 1) and the detrended actual aggregate spending series together with a fitted regression line. We use the monthly series on Real Personal Consumption Expenditures: Durables (DDURRA3M086SBEA) from the Federal Reserve Economic Database (FRED). We take the natural logarithm and apply an HP-filter (with smoothing parameter $\lambda = 129,600$) to the actual aggregate spending series in order to obtain a measure for the cyclical component of consumer spending. The sample period is 1984:1 to 2012:12.

the fraction of respondents with a favorable outlook on current buying conditions for durable household goods minus those with an unfavorable outlook. The shaded gray regions are recessions, as identified by the NBER. This series is clearly procyclical, with a particularly large drop during the Great Recession.

We next investigate to what extent the reported readiness to spend on durable goods is correlated with aggregate consumer spending on durables from the NIPA accounts. Given that we want to learn from the microdata whether increased inflation expectations are indeed associated with greater consumer spending, it is crucial that there exists a link between what people report in the Michigan Survey about their readiness to spend and what actually shows up in the data. For this purpose, we compare the aforementioned aggregate index of spending readiness with detrended real aggregate consumer spending on durables at a monthly frequency. We apply an HP-filter (with smoothing parameter $\lambda = 129,600$) to the natural logarithm of the actual aggregate spending series in order to obtain a measure for the cyclical component of consumer spending. Figure 2 shows a scatter plot of the two series. There is a clear positive correlation between the average reported readiness to spend on durables and aggregate durables consumption, with a contemporaneous correlation

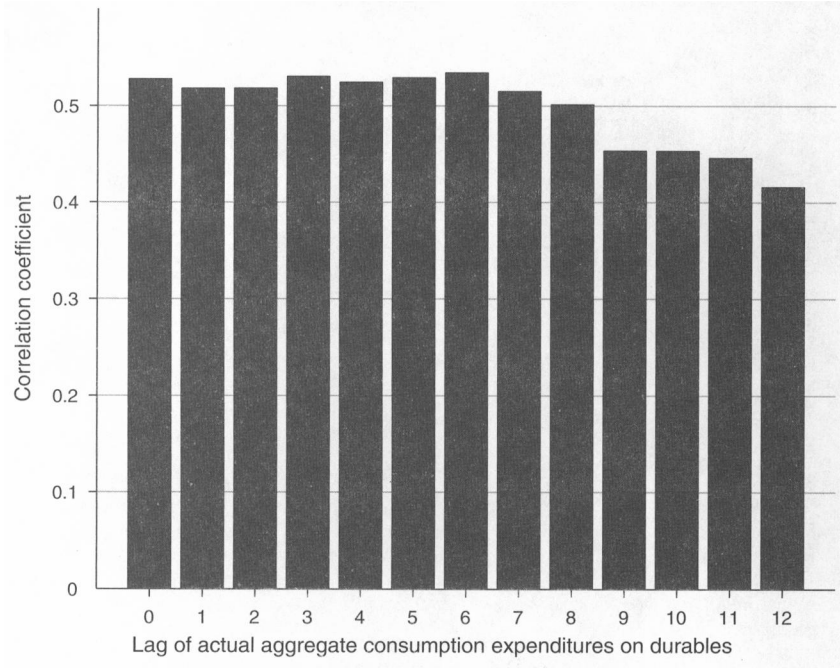

FIGURE 3. DYNAMIC CORRELOGRAM BETWEEN AGGREGATE ACTUAL CONSUMPTION EXPENDITURES ON DURABLES AND THE REPORTED READINESS TO BUY DURABLES

Notes: See notes to Figure 2. This figure shows a dynamic correlogram between the reported readiness to spend on durables (aggregate index) and the detrended actual aggregate spending series.

among the series of 0.53. Figure 3 displays the dynamic correlogram between the reported readiness to spend in the survey and the actual aggregate spending series. The correlations stay at a similar level until a lead of the readiness series of six months. Overall, we conclude that the reported readiness to spend on durables is a reasonable proxy (or predictor) for movements in aggregate durables consumption.

The left panel of Figure 4 plots the average of the one-year ahead expected inflation rate across individual responses at each point in time together with the actual one-year ahead inflation rate. The shaded gray regions represent $+/-$ one standard deviation of the survey responses. The actual inflation rate is the corresponding 12 months ahead rate as measured by the headline CPI, and has thus been brought into sync with the time horizon for inflation expectations. Overall, it appears that the one-year inflation expectations from the Michigan Survey track the actual inflation rate reasonably well. The graph also suggests that we have sufficient variation across households in inflation expectations to learn from a cross-sectional analysis of the data. The right panel plots the five- to ten-years-ahead inflation expectations. Even for longer horizon inflation expectations we have a substantial amount of cross-sectional heterogeneity that should help us identify the link between long-term inflation expectations and spending.[8]

[8] Figure 4 shows that a non-negligible fraction of households apparently have deflation expectations, which may raise concerns about the reliability of the inflation expectation data in the Michigan Survey. Interestingly, however,

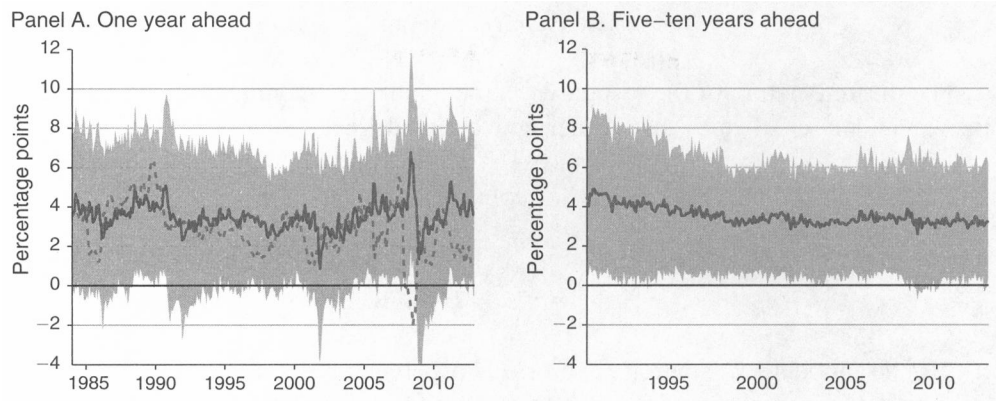

FIGURE 4. INFLATION EXPECTATIONS

Notes: The left panel, labeled "One year ahead," plots the average one-year inflation expectations (solid line) together with the actual one-year-ahead inflation (dashed line) and a cross-sectional one standard deviation interval (gray shaded area). Inflation expectations in this panel are based on survey question (Q2). We have removed all month-household observations with inflation expectation observations that are larger than 20 percent in absolute value. Actual inflation, the timing of which has been brought in sync with the point in time for which inflation expectations were uttered, is based on the headline CPI (series CPIAUCSL from the St. Louis Federal Reserve Bank database FRED). The sample period is 1984:1 to 2012:12. The last two inflation observations for November and December 2013 are missing. The right panel, labeled "Five–ten years ahead," shows the average five-to-ten year annual inflation expectations together with the cross-sectional one standard deviation interval. Inflation expectations in this panel are based on survey question (Q3). We have removed all month-household observations with inflation expectation observations that are larger than 20 percent in absolute value.

In addition, we present in the online Appendix to this paper some basic raw correlations between the one-year-ahead inflation expectations and the qualitative measures of readiness to spend (five- to ten-years-ahead inflation expectations for the "readiness to spend on cars" question). The correlation coefficient between expected inflation and the readiness to spend on durable goods is −0.047 when pooling observations across respondents and across time. This correlation is not only negative but also small. In comparison, the correlation between the reported readiness to spend and other idiosyncratic variables, expected aggregate business conditions, the current financial situation of the households, unemployment expectations, and economic policy trust, are not only of the expected sign but also much larger in absolute value. These results are stable across a variety of demographic groups and over time.

Finally, the online Appendix also analyzes more closely the reasons households give in the survey regarding why they think it is a good or a bad time to buy household durables, cars, or houses. This analysis reveals that future price increases or decreases as factors influencing the households' spending decisions always pale in comparison to current prices or whether the households have the impression that the market is currently particularly buyer- or seller-friendly.

Fleckenstein, Longstaff, and Lustig (2013) find, using data on the market prices of inflation swaps and options, that the market places substantial probability weight on deflation scenarios in which prices decline by more than 10 to 20 percent over extended horizons. To the extent that the respondents in the Michigan Survey have inflation expectations consistent with the support of the market distribution of inflation, the substantial cross-sectional heterogeneity of inflation expectations in the Michigan Survey may thus be not too surprising.

III. Empirical Setup

The discrete nature of the responses to the qualitative buying attitudes questions presents some challenges that render conventional linear regression specifications inappropriate. We assume that there exists an unobserved, continuous measure of readiness to spend, $y^*_{i,t}$. We model the evolution of this continuous measure of readiness to spend as

$$y^*_{i,t} = \beta_1 \pi^e_{i,t} + \beta_2 \pi^e_{i,t} \times D_{ZLB} + \mathbf{x}_{i,t}\gamma + \epsilon_{i,t}. \tag{8}$$

$\pi^e_{i,t}$ is the amount of inflation (expressed in percentage points) that household i expects in the 12 months subsequent to date t, and D_{ZLB} is a dummy variable for the zero lower bound period, which takes on unity from 2008:12 to 2012:12 (and zero otherwise). $\mathbf{x}_{i,t}$ is a vector of controls. It includes the dummy variable D_{ZLB} as well as a number of different idiosyncratic and aggregate controls which we discuss in more detail below. β_1 measures the partial effect of an increase in expected inflation on the willingness to spend, holding all factors in $\mathbf{x}_{i,t}$ constant. The interaction term between expected inflation and the dummy, D_{ZLB}, allows this relationship to be different when the nominal interest rate is close to zero, with the partial effect of more expected inflation on readiness to spend given by $\beta_1 + \beta_2$. γ is the coefficient vector on the controls.

The latent variable $y^*_{i,t}$ is not observable, but the discrete survey responses, $y_{i,t}$, are. The survey responses are coded in such a way that three outcomes are possible: "1" indicating that now is a good time to buy household consumer durables, "−1" meaning that now is a bad time to buy, and "0" saying that now is neither a good nor a bad time to buy. We model the relationship between $y^*_{i,t}$ and $y_{i,t}$ as

$$y_{i,t} = \begin{cases} -1 & \text{if } y^*_{i,t} \leq \alpha_1 \\ 0 & \text{if } \alpha_1 < y^*_{i,t} \leq \alpha_2 \\ +1 & \text{if } \alpha_2 < y^*_{i,t} \end{cases} \tag{9}$$

with threshold values α_1 and α_2. We estimate this model as an ordered probit, using the observations on y to estimate $(\beta_1, \beta_2, \gamma)$ as well as α_1 and α_2 via maximum likelihood.

To be able to interpret β_1 and $\beta_1 + \beta_2$ as the "causal" effect of expected inflation on desired spending, the regression specification needs to control for determinants of spending, which may be correlated with expected inflation. These covariates can be both cross-sectional or aggregate in nature. For example, one might imagine that certain demographic characteristics are correlated with both buying attitudes and inflation expectations. The vector of controls therefore includes a rich set of demographic factors. We include a dummy which takes on unity for female respondents and zero for males ("Sex"), a dummy which switches on if the respondent is married and otherwise not ("Married"), and a dummy which takes on unity in case the respondent holds a college degree and zero otherwise ("College"). We

also add dummies for each race, except for non-Hispanic Caucasians, i.e., "African American," "Hispanic American," "Native American," and "Asian American" as well as for each census region, except for North Central, i.e., "West," "Northeast," and "South." We also consider the family size of the respondent and add polynomials of the age of the respondent ("Age," "Age^2," and "Age^3") to account for possible changes in life-cycle behavior. We address seasonality by including a set of monthly dummies. Finally we include the natural logarithm of reported current real income of the household.[9]

There may be other cross-sectional covariates imperfectly related to demographics, which are nevertheless also correlated with both inflation expectations and buying attitudes. For example, one might worry that some people are naturally optimistic (or pessimistic) by nature. An optimist might on average express positive buying attitudes and lower than average expected inflation. Failing to control for this characteristic would induce a negative correlation between expected inflation and the error term. Alternatively, one could imagine that a respondent is "bullish" about the aggregate economy, thinking that now is a relatively good time to buy durable goods but expects that this high demand will lead to future price increases. Not controlling for this attitude about the aggregate state would tend to induce a positive correlation between expected inflation and the error term.

Fortunately, the Michigan Survey contains a rich set of information on idiosyncratic expectations and attitudes for which we can control in our regression specifications. We include in our set of controls (qualitative) *idiosyncratic expectations* about the *idiosyncratic situation* of the household: its expected change in financial situation (Q4) and the expected trajectory of its real income (Q5). Next, we include *idiosyncratic expectations* about the *aggregate economic situation*: the expected (qualitative) changes in the nominal interest rate (Q6) and the expected (qualitative) aggregate business conditions in one year (Q7) as well as in five years (Q8). Moreover, we add the expected (qualitative) change in the unemployment rate (Q9). We include the current financial situation of the household relative to the previous year (Q10) and a question, (Q12), which asks whether the government is doing a good job, a fair job, or a poor job in fighting inflation and unemployment to measure the respondents' trust in US economic policy. We surmise that households with a lack of trust in economic policy will be reluctant to commit themselves to major purchases and may be more concerned about high future inflation. As with the buying attitudes question, the responses to all these questions are coded in one of three discrete categories: up, down, or "about the same." The inclusion of idiosyncratic expectations (about either idiosyncratic or aggregate conditions) is meant to combat the "optimist/pessimist" problem, while the inclusion of idiosyncratic expectations about aggregates is meant to deal with the second potential endogeneity problem whereby respondents who expect a strong economy may also anticipate future price increases.

Finally, the control vector also needs to account for purely aggregate covariates. Similarly to the logic discussed above, a strong economy may be positively

[9] We use the survey question on the current nominal household income (in US dollars) and deflate it with the consumer price index (CPIAUCSL) from the St. Louis Federal Reserve Bank data base FRED.

correlated with current buying attitudes but also with expected future inflation. We therefore include several aggregate controls. These aggregate controls also serve as a validation exercise concerning the survey data. Economic theory makes predictions about how different aggregate controls ought to impact buying attitudes; to the extent to which our regressions confirm these effects, we gain additional confidence that the survey data are measuring what they intend to measure. Another way to control for aggregate conditions is to simply include time dummies, which we do in a robustness check in Table 3.

As aggregate controls we use (Q7) to construct an index of *aggregate expectations* about the *aggregate economic situation*: the index measures the share of respondents saying that the United States as a whole will have good business conditions during the next 12 months minus the share of those respondents answering that the country will have bad business conditions. This index is normalized in $[-100, 100]$. We also include the cross-sectional standard deviation of expected inflation for each month to measure the degree of dispersion as a proxy for time-varying idiosyncratic inflation uncertainty. In order to proxy for the overall amount of uncertainty in the economy, we consider Bloom's volatility index (see Bloom 2009).[10] We also include the federal funds rate, the civilian unemployment rate, and the current inflation rate (percentage year-over-year change in the consumer price index), all three denoted in percentage points.[11] Moreover, we add a rolling 12-months forward-looking window estimate of inflation volatility as a proxy for aggregate inflation uncertainty.

Lastly, we consider regional relative durable goods prices, according to the census region in which the respondent resides: West, North Central, Northeast, and South. We use the all urban consumers CPI for durables per region from the US Bureau of Labor Statistics divided by the all items CPI for that region. Prior to January 1987 both series are available at a bi-monthly frequency only and we interpolate the series by assuming no change between months. Before calculating relative prices, we seasonally adjust both series. We finally take natural logs and linearly detrend the relative durable goods price. The inclusion of the relative price of durables ensures that the coefficient on expected inflation is not being driven by changes in the relative price of durables.[12]

In our baseline exercises, we restrict attention to those data points which constitute first interviews, which means that the baseline dataset is truly a set of repeated cross-sections. This leaves us with a sample of about 68,000 observations.

[10] Specifically, we use the VXO (CBOEVXO) series from Datastream from 1986 onwards and fill in the first 24 months with the numbers from Bloom (2009).

[11] The series are from the St. Louis Federal Reserve Bank data base FRED. We use FEDFUNDS, UNRATE, and CPIAUCSL.

[12] We also experimented with a specification where we included the cyclical component of one- to five-year lagged aggregate real durable consumption spending from NIPA data in order to capture a potential durable goods cycle. We indeed find that lags two- to five-years of aggregate durable consumption expenditures have a negative influence on readiness to spend on durables today. However, the inflation expectation results are unaltered by this inclusion.

IV. Results

This section presents results from ordered probit specifications as laid out in the previous section. Subsection A presents the baseline results, while Subsection B conducts a variety of robustness checks and extensions to our baseline exercise.

A. *Baseline Results*

This section presents the main results of the paper. For our baseline specification we focus on buying conditions for durable goods and expected inflation over a one-year horizon. The results for this baseline specification (except for the demographic controls) are shown in Table 1. The results for cars and houses are relegated to the online Appendix.

Table 1 shows the estimated coefficients as well as marginal effects evaluated for "normal" times, when the federal funds rate was larger than zero ($D_{ZLB} = 0$), and at the zero lower bound ($D_{ZLB} = 1$).[13] The marginal effects have the economic interpretation as the change in the probability of having a favorable outlook on buying durable goods for a one percentage point increase in expected inflation. When calculating marginal effects, we set the remaining variables to their means conditional on $D_{ZLB} = 0$ and $D_{ZLB} = 1$, respectively.[14] In each case we document the point estimates together with standard errors in parentheses underneath, and denote significance at the 1 percent, 5 percent, and 10 percent level by "***," "**," and "*," respectively. The baseline estimates for the demographic controls are shown in Table 2. They show that young, male, non-Hispanic Caucasians without a college degree are, everything else equal, most favorably disposed to buying durable goods.

With respect to the coefficients on the economic control variables, we obtain for the most part plausible and significant estimates, which makes us confident that the Michigan data do indeed measure the underlying economic variables of interest reasonably well. As one would expect, the expected financial situation of the household and its real income, the expected business conditions (idiosyncratic and aggregate), the current financial situation, and the current real household income all have significantly positive effects on the reported spending readiness. In addition, a positive judgement of US economic policy also affects spending dispositions positively. Moreover, an expected increase in *future* nominal interest rates makes people want to spend more *today*, while higher economic uncertainty in the form of stock market volatility, inflation volatility and higher unemployment rates (both current and expected) decrease the probability that people find buying conditions favorable.

[13] We report the marginal effects for the probability of the highest outcome, i.e., $p_1 = P(y = 1|\mathbf{z})$ with $\mathbf{z} = (\pi^e, \pi^e \times D_{ZLB}, \mathbf{x})$, and thus for the case that households find buying conditions favorable. Let $\phi(\cdot)$ denote the first derivative of the normal density function $\Phi(\cdot)$ and $\delta = (\beta_1, \beta_2, \gamma)$. The marginal effect for inflation expectations at $D_{ZLB} = 1$ is calculated as $\partial p_1(\mathbf{z})/\partial \pi^e = (\beta_1 + \beta_2)\,\phi\big(\alpha_2 - \bar{\mathbf{z}}_{|D_{ZLB}=1}\delta\big)$, where $\bar{\mathbf{z}}_{|D_{ZLB}=1}$ denotes the mean of $\mathbf{z}$ within the zero lower bound regime. Accordingly, $\partial p_1(\mathbf{z})/\partial \pi^e = \beta_1 \phi\big(\alpha_2 - \bar{\mathbf{z}}_{|D_{ZLB}=0}\delta\big)$ is the corresponding marginal effect at $D_{ZLB} = 0$. The marginal effect with respect to a control variable x_k is $\partial p_1(\mathbf{z})/\partial x_k = \gamma_k \phi\big(\alpha_2 - \bar{\mathbf{z}}_{|D_{ZLB}=1}\delta\big)$ within the zero lower bound regime and $\partial p_1(\mathbf{z})/\partial x_k = \gamma_k \phi\big(\alpha_2 - \bar{\mathbf{z}}_{|D_{ZLB}=0}\delta\big)$ when interest rates are away from it. See also Wooldridge (2002), Chapter 15.

[14] We have also calculated marginal effects at more percentiles of the inflation expectation distribution, i.e., at the tenth, twenty-fifth, fiftieth, seventy-fifth, and ninetieth percentiles, and found similar values.

TABLE 1—BASELINE SPECIFICATION: READINESS TO SPEND ON DURABLES AND 1Y INFLATION EXPECTATIONS

Dependent variable: Buying conditions for durables Observations: 67,855		Sample: 1984:1 to 2012:12 Pseudo R^2: 0.0671	
		Marginal effects	
Independent variables	Coefficients	at $D_{ZLB} = 0$	at $D_{ZLB} = 1$
Inflation expectations (1Y)	−0.0009	−0.0002	−0.0047***
	(0.0015)	(0.0004)	(0.0011)
ZLB dummy interacted w/ expected inflation (1Y)	−0.0112***		
	(0.0031)		
ZLB dummy	0.1017***	0.0306***	
	(0.0315)	(0.0095)	
Expected financial situation of household	0.0263***	0.0079***	0.0101***
	(0.0091)	(0.0027)	(0.0035)
Expected real household income	0.0211**	0.0064**	0.0081**
	(0.0083)	(0.0025)	(0.0032)
Expected change in nominal interest rate	0.0436***	0.0131***	0.0168***
	(0.0074)	(0.0022)	(0.0029)
Expected 1Y aggregate business conditions (idio.)	0.1300***	0.0392***	0.0500***
	(0.0068)	(0.0020)	(0.0026)
Expected 5Y aggregate business conditions (idio.)	0.0623***	0.0188***	0.0240***
	(0.0068)	(0.0020)	(0.0026)
Expected unemployment	−0.0652***	−0.0196***	−0.0251***
	(0.0089)	(0.0027)	(0.0034)
Current financial situation	0.1189***	0.0359***	0.0458***
	(0.0067)	(0.0020)	(0.0026)
Economic policy trust (idiosyncratic)	0.1119***	0.0337***	0.0431***
	(0.0088)	(0.0026)	(0.0034)
Expected 1Y aggregate business conditions (index)	0.0016***	0.0005***	0.0006***
	(0.0003)	(0.0001)	(0.0001)
Cross-sectional dispersion in expected inflation (1Y)	−0.0810***	−0.0244***	−0.0312***
	(0.0150)	(0.0045)	0.0058
VXO	−0.0047***	−0.0014***	−0.0018***
	(0.0008)	(0.0002)	(0.0003)
Federal funds rate	0.0230***	0.0069***	0.0088***
	(0.0036)	(0.0011)	(0.0014)
Civilian unemployment rate	−0.0504***	−0.0152***	−0.0194***
	(0.0065)	(0.0020)	(0.0025)
Current inflation rate	−0.0236***	−0.0071***	−0.0091***
	(0.0061)	(0.0018)	(0.0024)
Current inflation volatility	−0.0221***	−0.0067***	−0.0085***
	(0.0067)	(0.0020)	(0.0026)
Relative price of durable goods	0.0015	0.0004	0.0006
	(0.0016)	(0.0005)	(0.0006)

Notes: This table shows the results from the ordered probit baseline estimation. Standard errors are in parentheses. The Zero Lower Bound (ZLB) Dummy takes on unity from 2008:12 to 2012:12 (and zero otherwise). Marginal effects measure the effect of a particular variable on the probability that households find buying conditions favorable in percentage points; evaluated inside and outside the ZLB regime with the remaining variables set at their respective conditional means. We have removed all month-household observations with inflation expectation observations that are larger than 20 percent in absolute value. The baseline specification has been run on the subsample of first interviews.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

TABLE 2—BASELINE SPECIFICATION: DEMOGRAPHIC CONTROLS

Dependent variable: buying conditions for durables Observations: 67,855		Sample: 1984:1 to 2012:12 Pseudo R^2 : 0.0671	
		Marginal effects	
Independent variables	Coefficients	at $D_{ZLB} = 0$	at $D_{ZLB} = 1$
Sex	−0.0692***	−0.0208***	−0.0266***
	(0.0109)	(0.0033)	(0.0042)
Married	−0.0014	−0.0004	−0.0005
	(0.0133)	(0.0040)	(0.0051)
College degree	−0.0294**	−0.0089**	−0.0113**
	(0.0120)	(0.0036)	(0.0046)
African American	−0.0116	−0.0035	−0.0045
	(0.0200)	(0.0059)	(0.0075)
Hispanic American	−0.1167***	−0.0352***	−0.0450***
	(0.0248)	(0.0075)	(0.0096)
Native American	−0.0436	−0.0131	−0.0168
	(0.0551)	(0.0166)	(0.0212)
Asian American	−0.1473***	−0.0444***	−0.0567***
	(0.0390)	(0.0118)	(0.0150)
Census region: west	−0.0384**	−0.0116**	−0.0148**
	(0.0158)	(0.0048)	(0.0061)
Census region: northeast	−0.0102	−0.0031	−0.0039
	(0.0161)	(0.0048)	(0.0062)
Census region: south	−0.0145	−0.0044	−0.0056
	(0.0139)	(0.0042)	(0.0054)
Family size	−0.0209***	−0.0063***	−0.0081***
	(0.0047)	(0.0014)	(0.0018)
Age	−0.0197***	0.0002	0.0007**
	(0.0071)	(0.0002)	(0.0003)
Age^2	0.0004**		
	(0.0001)		
Age^3	−0.0000**		
	(0.0000)		
Current real household income (in logs)	0.0525***	0.0159***	0.0202***
	(0.0081)	(0.0025)	(0.0031)

Notes: See notes to Table 1. The demographic controls include a dummy which takes on unity for female respondents and zero for males ("Sex"); a dummy which takes on unity if the respondent is married and zero if not ("Married"); a dummy which takes on unity if the respondent holds a college degree and zero if not ("College"). Moreover, we include dummies for each race, except for non-Hispanic Caucasians, i.e., "African American," "Hispanic American," "Native American," and "Asian American" as well as for each census region, except for North Central, i.e., "West," "Northeast," and "South." We also add the family size, polynomials of the age of the respondent ("Age," "Age^2," "Age^3,"), and a set of month dummies (not reported).

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Higher cross-sectional dispersion in expected inflation also has negative effects and is thus consistent with the interpretation of time-varying inflation dispersion as a measure of time-varying idiosyncratic inflation uncertainty. The coefficient on the zero lower bound dummy is positive and significant, suggesting that households were more likely to have a favorable attitude about buying durables in the period 2008–2012. This may seem puzzling, but recall that this coefficient measures the

effect of the zero lower bound regime holding all other control variables fixed. One interpretation of this positive coefficient is that nonstandard policy actions, particularly in the form of bailouts and fiscal stimulus, led households to have more optimistic buying attitudes than otherwise would have been warranted given observed economic conditions.

For the expected one-year inflation rate, we obtain a negative coefficient ($\beta_1 = -0.0009$), which is even more negative when the economy is at the zero lower bound for nominal interest rates ($\beta_2 = -0.0112$). The former is statistically not significantly different from zero, while the latter is significant at the 1 percent level. Moreover, the marginal effect of expected inflation on spending is equal to -0.0002 for times of positive interest rates, meaning that a 1 percentage point increase in expected inflation approximately lowers the probability that households have a positive attitude towards spending by 0.02 percentage points. The adverse effect of inflation expectations on willingness to spend is larger and statistically significant when evaluated at the zero lower bound (the marginal effect is -0.47 percentage points). This violates standard Fisherian logic; it is, however, consistent with the results from Van Zandweghe and Braxton (2013), who argue that in recent times the real interest rate sensitivity of durables purchases has declined, which would mean that whatever positive effect expected inflation might have on durables spending through the interest rate channel might have been weakened in recent times and other, negative effects might have become stronger.[15]

Whether the zero lower bound binds or not, the impact of inflation expectations on desired spending is small in absolute value. To quantify the implied effect of higher expected inflation on aggregate spending, we estimate a bivariate VAR with the aggregate index for buying conditions for durable goods (see Figure 1) and the cyclical component of the natural logarithm of aggregate real durable consumption expenditure (see Figure 2). We order the buying conditions index first. Figure 5 shows the impulse response of real durable consumption expenditure to a shock to the buying conditions index, where the size of this shock is computed from the estimated marginal effects of a one percentage point increase in expected inflation from our baseline regression (see Table 1), either outside (left panel) or inside (right panel) the zero lower bound. In periods of positive interest rates, there is essentially no effect of higher expected inflation on aggregate real durable consumption expenditure. Inside the zero lower bound the impact effect is -0.1 percent. Though statistically significant, this effect is tiny given the overall volatility of monthly real durable consumption expenditure of 3.7 percent.

The impact of inflation expectations on desired spending is also small when compared to the impact of other variables. For example, if the household reports a good one-year ahead business outlook versus a neutral one, the probability of reporting a positive attitude towards spending on durable households goods increases by almost 4 percentage points outside the zero lower bound episode, and by 5 percentage points inside it. Similarly important is the current financial situation of the

[15] The fourth panel of Table 3 shows that this result is not driven by us imperfectly controlling for aggregate effects, because a specification with month fixed effects and no aggregate controls yields essentially identical results.

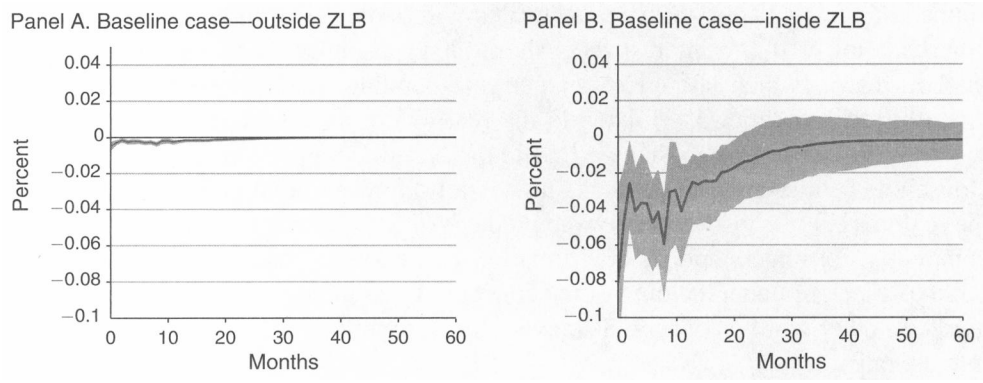

FIGURE 5. IMPULSE RESPONSE FUNCTIONS ON REAL DURABLE CONSUMPTION EXPENDITURES

Notes: This figure shows the impulse response of real durable consumption expenditures from a bivariate VAR with the aggregate index for the buying conditions for durable goods (see Figure 1) ordered first and the HP-filtered (with smoothing parameter $\lambda = 129,600$) natural logarithm of real durable consumption expenditures (see Figure 2) ordered second, where the size of the innovation to the aggregate index is computed, respectively, from the marginal effects of a one percentage point increase in inflation expectations from the baseline scenario (see Table 1) outside and inside the zero lower bound. The sample period is 1984:1 to 2012:12.

household relative to the previous year and the overall trust in economic policy. It is important to point out that these three variables maintain their positive influence and statistical significance across all specifications and data cuts we study, even when sample sizes are considerably smaller than in the baseline. This means that the main robust impact factors for spending decisions on durables are idiosyncratic expectations about both idiosyncratic and aggregate economic conditions as well as the trust of the households in the competence of economic policymakers.

The fact that these other putatively important idiosyncratic determinants of spending decisions show up consistently and significantly the way economic theory predicts is a strong argument against the view that in survey data people just do not respond accurately. Rather, our results suggest that they do and that inflation expectations are really different from the other impact factors. Either inflation expectations are reported truthfully, but do not matter for spending decisions, or they are reported inaccurately, because they are unimportant to households. Either way, they do not seem to be very important for economic decision making for the households in the Michigan Survey of Consumers.

Furthermore, the expected change in nominal interest rates has a significant impact on spending attitudes with a sign that conforms to standard intuition—when households expect interest rates to rise in the future, they are about 1.3 percent more likely to report a positive attitude toward buying durable goods in the present. This warrants some explanation: as the discussion of buying reasons for durables in the online Appendix shows, the question about future interest rates is framed in a way that low current interest rates are good for spending now, whereas declining future interest rates are bad for current spending. The idea is that if households can borrow at lower interest rates later they may postpone their spending until this lower interest rate can be locked in. Implicit here is a violation of an arbitrage condition

connecting current long-term interest rates with expected future short-term rates; otherwise lower future interest rates should lead to lower long-term interest rates in the present, which should foster current spending, not hinder it. However, if this arbitrage condition is violated in the real world, as the wording in the survey seems to suggest, the sign that we find in the baseline regression is to be expected. Households understanding (at least qualitatively) how nominal interest rates impact the real margin of substitution between today's and tomorrow's consumption, while apparently not understanding how inflation expectations change this margin, may point to a lack of understanding of the concept of real interest rates for many households. In other words, households may suffer from nominal illusion with respect to interest rates.

B. *Robustness and Extensions*

This subsection considers a number of robustness checks and extensions to the baseline specification, described in detail below.

Excluding Idiosyncratic Expectations Controls.—We rerun our baseline probit model and successively omit different idiosyncratic expectations control variables. Our objective in doing so is to try to gain some insight into the various channels that may be at work connecting expected inflation and spending attitudes.

In a first variation on the baseline specification (see the upper panel of Table 3), we exclude the economic policy trust variable from (Q12) to gauge whether higher inflation expectations work through the "policy distress" channel advocated by Paul Volcker and John Taylor and described in the introduction. If this were the case the marginal effects should become more negative when the economic policy trust variable is left out of the regression model. We indeed find this decline in the marginal effects, but not in a statistically significant way. Of course, in this specification we still control for other idiosyncratic expectations variables, like expected business conditions, which are likely to be positively correlated with economic policy trust.

Therefore, we proceed in dropping all idiosyncratic expectations from the probit model as controls (see the third panel of Table 3); i.e., in addition to the economic policy trust variable, we also leave out the expected financial situation of the household (Q4), its expected real income (Q5), the expected change in the nominal interest rate (Q6), the expected unemployment rate (Q9), and both the one year and five year expected aggregate business conditions (Q7 and Q8, respectively). One might be concerned that in general equilibrium inflation expectations really work through growth or unemployment expectations—when one household expects higher inflation, others might expect higher inflation, resulting in greater spending, more demand, and greater future income. Thus, controlling for expectations about the future state of the economy might be preventing higher expected inflation from showing up with a positive effect on spending attitudes. The third panel of Table 3 shows, however, that the impact of increased inflation expectations on the reported readiness to spend on durable consumption goods becomes even more negative when idiosyncratic expectations controls are excluded from the empirical model. Moreover, the coefficient on expected inflation ($\beta_1 = -0.0086$) becomes

TABLE 3—BASELINE SPECIFICATION: ROBUSTNESS CHECKS

Specification	Independent variables	Coefficients	Marginal effects at $D_{ZLB} = 0$	Marginal effects at $D_{ZLB} = 1$
w/o idiosyncratic economic policy trust				
($N = 68{,}535$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0017	−0.0005	−0.0049***
		(0.0014)	(0.0004)	(0.0011)
w/o idiosyncratic expectations				
($N = 81{,}406$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0086***	−0.0027***	−0.0075***
		(0.0013)	(0.0004)	(0.0010)
w/gas price expectations, home ownership, and subjective probabilities				
($N = 16{,}828$, Sample: 1998:1 to 2012:12)	Expected inflation (1Y)	0.0050	0.0014	−0.0029***
		(0.0037)	(0.0010)	(0.0011)
	Probability of job loss	−0.0016***	−0.0004***	−0.0006***
		(0.0006)	(0.0001)	(0.0002)
	Probability of real income gains	0.0007	0.0002	0.0003
		(0.0007)	(0.0001)	(0.0002)
	Expected change in gas price (1Y)	−0.0007**	−0.0002**	−0.0003**
		(0.0003)	(0.0001)	(0.0001)
	Home owner	−0.0248	−0.0068	−0.0095
		(0.0304)	(0.0084)	(0.0116)
Month fixed effects, no aggregate controls				
($N = 67{,}860$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0012	−0.0004	−0.0037***
		(0.0015)	(0.0005)	(0.0010)
5Y inflation expectations				
($N = 47{,}271$, Sample: 1990:4 to 2012:12)	Expected inflation (5Y)	−0.0012	−0.0004	−0.0026*
		(0.0022)	(0.0007)	(0.0016)

Notes: This table displays a variety of robustness checks on the baseline specification, described in the column "Specification". All of the standard controls from the baseline specification are included in each regression, but their coefficients and standard errors are omitted in the table. Marginal effects at $D_{ZLB} = 1$ are calculated based on the interaction coefficient between expected inflation and the ZLB dummy, which is omitted in the table. The number N in parentheses below each specification description is the number of observations used in the estimation of that specification; the time horizon of the various samples is also specified there. Like the baseline specification all these regressions have been run on the subsample of first interviews only. See also notes to Table 1.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

significantly different from zero, which is also the case for both marginal effects (-0.0027 at $D_{ZLB} = 0$ and -0.0075 at $D_{ZLB} = 1$).

This means that increased inflation expectations appear to be negatively impacting spending attitudes because in part they signal bad economic times and potentially uncertain stabilization policy stances ahead. This is at least consistent with, if not dispositive of, a Volcker-Taylor policy distress channel of inflation. When we include the policy trust variable and the other idiosyncratic expectation variables, we effectively control for this effect and the coefficient on inflation expectations comes out close to zero and statistically insignificant, at least during normal times.

Gas Price Expectations, Home Ownership, and Subjective Job Loss Probabilities.—As a next robustness check, we add the expected one-year change in the price of gasoline in cents per gallon, based on (Q15), to our baseline model. It might be

the case that households primarily have gas price changes in mind when asked about their expected inflation rate and not controlling for gas price expectations might thus contaminate our results. We also add a dummy which takes on unity if the respondent owns a house and zero if not ("Home Owner") as an additional demographic control in order to proxy for the wealth level of the household. Finally, we also include the subjective probabilities for real income gains (Q13) and job loss (Q14), denoted in percentage points. The latter addition is potentially important, since it allows us to control for general idiosyncratic optimism and pessimism in a more continuous way than with the largely qualitative controls in the baseline specification. Furthermore, the question on the probability of a job loss during the next five years is particularly interesting since we have not included a measure for the individual job situation (as opposed to the overall unemployment rate) so far. While the data on gas price expectations and homeownership are available from 1990 on, the questions on subjective probabilities for real income gains and job loss were introduced into the survey only from 1998 on. We present the specification with all four additional controls, i.e., on a sample from 1998:1 onwards.

In the fourth panel of Table 3 we show that the one-year gas price expectations have a negative impact on the reported readiness to spend on durables, statistically significantly so, both inside and outside the zero lower bound. This is consistent with a negative supply/wealth shock view of higher gas prices. With respect to the effect of increased inflation expectations on the reported readiness to spend on durables, our baseline results of essentially no effect outside the zero lower bound and a mildly negative impact during the zero bound are qualitatively the same. Interestingly, the effects get weaker relative to the baseline estimation, which means that part of the negative effect we are picking up in the baseline specification might indeed be driven by gas price expectations and their negative supply/wealth effects.

In terms of the other new controls in this specification, the impact of home ownership is negative, which is perhaps counterintuitive. However, the impact of home ownership is not significantly different from zero and measures the effect of home ownership after controlling for current and expected household income. The probability that households report a positive attitude towards spending increases with the probability of real income gains and decreases with the probability of a job loss, as expected.

Five- to Ten-Years Inflation Expectations.—We show the estimation results for the specification where we replace one-year ahead expected inflation with the five- to ten-year inflation expectations in the sixth panel of Table 3. There is a possibility that longer-term inflation expectations conform better with the time horizon for the buying decision on some consumer durables. Because of the availability of the long-term inflation expectations only from 1990:4 on, we have to estimate this specification on a somewhat smaller sample. In line with our baseline findings, we estimate a near-zero effect for the expected five- to ten-year inflation rate on the reported readiness to spend on durables for the time before the zero lower bound period, and a statistically significant (at the 10 percent level) negative marginal effect during the recent months (-0.0026).

TABLE 4—RESULTS USING THE TWICE INTERVIEWED HOUSEHOLDS

Dependent variable: buying conditions for durables Observations: 51,607		Sample: 1984:1 to 2012:12 Pseudo R^2: 0.0748	
		Marginal effects	
Independent variables	Coefficients	at $D_{ZLB} = 0$	at $D_{ZLB} = 1$
Change in inflation expectations (1Y)	0.0031** (0.0015)	0.0009** (0.0004)	−0.0009 (0.0010)
ZLB dummy interacted with change in expected inflation (1Y)	−0.0057* (0.0032)		
Dependent variable: change in buying conditions for durables Observations: 49,547		Sample: 1984:1 to 2012:12 Pseudo R^2: 0.0081	
		Marginal effects	
Independent variables	Coefficients	at $D_{ZLB} = 0$	at $D_{ZLB} = 1$
Change in inflation expectations (1Y)	−0.0009 (0.0013)	−0.0002 (0.0003)	−0.0017*** (0.0006)
ZLB dummy interacted with change in expected inflation (1Y)	−0.0059** 0.0029		

Notes: For this table we use the sample of households that are interviewed twice. In the upper panel we replace inflation expectations with the change in inflation expectations between interviews. In the lower panel we, in addition, change the dependent variable by creating a new dummy variable: "+1," if the household increased its readiness to spend, "0," if it had the same qualitative level of readiness to spend and "−1," if it decreased it.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Results Using the Panel Component of the Michigan Survey of Consumers.— While including a wide range of idiosyncratic expectations should help control for idiosyncratic optimism and pessimism directly, in this subsection, we make use of the overlapping panel dimension of the data as an alternative. As described in Section I, many of the households interviewed in the Michigan Survey are interviewed again six months later. This means that, for most households, we have a set of observations at two different points in time.[16]

Some results making use of the panel component are shown in Table 4. In a first specification, we keep the left hand side ordinal readiness to spend variable the same, but replace the level of expected inflation on the right hand side with its first difference across interviews. This means that the identifying variation in expected inflation is across time (for an individual), and is not driven by level differences in expected inflation in the cross-section. We indeed do observe a small change in the results in that *outside* the zero lower bound there is a small and statistically significant positive effect running from the change in expected inflation to readiness

[16]Roughly 75 percent of households are interviewed twice. The reason this differs from the 60 percent new, 40 percent second interview nature of the sample described in Section II is because of a stock/flow distinction. Each month, about 285 households are new, while 215 are households that were interviewed six months prior. This generates an approximate 60/40 flow split in any month, but $215/285 \approx 75$ percent of all households end up being re-interviewed. This means that the sample size focusing on households who are interviewed twice should be roughly 75 percent as large as when we focused on first time interviews only in Table 1. This is indeed the case: there are approximately 52,000 observations in Table 4 and 68,000 in Table 1.

to spend. In particular, households that experience a one percentage point higher increase in expected inflation than the average household are about 0.1 percent more likely to report that now is a good time to buy durables. *Inside* the zero lower bound the point estimate remains negative (though statistically insignificant). In other words, the result from our baseline specification that expected inflation has a lower (less positive, or more negative) impact on buying attitudes at the zero lower bound still obtains.

In a second specification, we difference both the left and right hand side variables of interest—that is, the (ordinal) *change* in buying attitudes is on the left hand side and the *change* in expected inflation is on the right hand side. Here the results are almost identical to our baseline analysis. In particular, the estimated effect of expected inflation on buying attitudes during times of positive interest rates is negative, but small and statistically insignificant. At the zero lower bound, the impact of higher expected inflation on buying attitudes is more strongly negative (in both the economic and statistical senses). Taken together, these results are somewhat mixed, but in our view do not make the case for an important inflation expectation management channel, particularly given the conventional wisdom that the effect of more expected inflation on spending should be larger at the zero lower bound, not smaller.

In the online Appendix to this paper we make another use of the panel dimension of the Michigan Survey of Consumers where we run a control function approach with past inflation expectations as instruments for current inflation expectations.[17] The concern here is that one might be worried that reporting or measurement error in expected inflation induces an attenuation bias. We do find some evidence for this effect: the marginal effects of higher expected inflation both inside and outside the zero lower bound are estimated to be more negative than in our baseline analysis. Economically, the estimated effects are nevertheless still quite small.

Cross-Sectional Heterogeneity.—In the next set of results we explore whether our main findings differ across demographic groups:

- "old" versus "young," split at the mean age of respondents in the sample of 48;
- college degree versus no college degree;
- "rich" versus "poor" (reported income in the top twenty percent for that year versus in the bottom twenty percent); and
- "accurate" (in an ex post sense) or "reasonable" (in an ex ante sense) inflation forecasters versus those with poor forecasts.

For the latter, we successively run our baseline specification on those respondents who (a) remained within a band of plus/minus one time series standard deviation of the realized annual inflation rate for which they were forecasting (128 basis points); (b) remained in their two interviews within one time series standard deviation of the actual annual inflation rate, in order to ensure that there is some consistency and not mere luck to their inflation expectations accuracy; (c) remained within a band of plus/minus 50 basis points of the actual annual inflation rate; (d) remained within

[17] The so-called "control function" approach is the standard way of using instrumental variables in a nonlinear regression model, such as an ordered probit.

a band of plus/minus 128 basis points of the average one-year inflation expectation in the Michigan Survey of Consumers; (e) remained within a band of plus/minus 128 basis points of the average one-year inflation expectations in the Survey of Professional Forecasters.[18] Specifications (a) to (c) are meant to focus on those respondents with ex post accurate inflation expectations, while specifications (d) and (e) focus on ex ante reasonable inflation expectations.

The estimation results are shown in Table 5. Except for the case of inflation expectation accuracy and reasonableness, the coefficients on expected inflation in each specification turn out to be very similar to one another and close to the baseline estimates—the coefficients are usually negative and always small in an absolute sense. The differences in the coefficients across groups are negligible, both statistically and economically. When we split the sample into those respondents who have been ex post close (or even close twice) to the actual inflation rate for the time period for which they gave a forecast ("accurate inflation expectations"), or into respondents who are close to the average expectation in the Michigan Survey ("reasonable inflation expectations"), we indeed find a positive effect from inflation expectations to spending, which is larger in the zero lower bound episode.[19] These effects are not statistically significant, except for the case of ex post very good inflation expectations that remained within a band of plus/minus 50 basis points of the actual annual inflation rate, where the marginal effect of inflation expectations on spending readiness is 3.8 percentage points.[20]

As a rough attempt to quantify the aggregate implications of these findings for "accurate" inflation forecasters, in Figure 6 we conduct a similar VAR exercise as in Figure 5, in which we estimate a bivariate VAR in the aggregate buying conditions index and real durable consumption expenditure. Here we compute the size of the innovation in the aggregate buying attitudes question from the estimated marginal effect of a one percentage point increase in expected inflation for those households whose inflation expectation is within 50 basis points of realized inflation, both outside and inside the zero lower bound (see the third row of the last panel of Table 5 for the estimated marginal effects). If all households reacted to higher expected inflation in the way that these accurate forecasters do, then aggregate expenditure on durable goods would increase only very slightly (and insignificantly) at times of nonzero interest rates, but would rise by about 0.6 percent at the zero lower bound. This stands in contrast to the baseline results depicted in Figure 5, in which durable goods spending declines by a negligible amount when interest rates are positive following an increase in expected inflation, and by about 0.1 percent when interest rates are zero. In other words, not only is the sign of the implied effect on durable expenditure from higher expected inflation more in line with basic theory, it is also quantitatively much larger when focusing on accurate inflation forecasters.

[18] We get this quarterly time series from the Federal Reserve Bank of Philadelphia and simply impose the quarterly observation equally on the three months within that quarter to be consistent with our baseline monthly frequency.

[19] For those that are close to the Survey of Professional Forecasters the baseline results do not change.

[20] Table 5 also reports that the complement sample, those that stayed outside a band of plus/minus 50 basis points of the actual annual inflation rate, behaves essentially like the unsplit baseline sample.

TABLE 5—BASELINE SPECIFICATION: CROSS-SECTIONAL HETEROGENEITY

Specification	Independent variables	Coefficients	Marginal effects at $D_{ZLB} = 0$	Marginal effects at $D_{ZLB} = 1$
Age > 48				
($N = 27{,}775$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0008	−0.0002	−0.0052***
		(0.0024)	(0.0007)	(0.0014)
Age < 48				
($N = 40{,}080$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0019	−0.0006	−0.0026**
		(0.0018)	(0.0005)	(0.0017)
College degree				
($N = 27{,}466$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	0.0022	0.0007	−0.0049***
		(0.0027)	(0.0008)	(0.0016)
No college degree				
($N = 40{,}389$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0026	−0.0008	−0.0039***
		(0.0017)	(0.0005)	(0.0014)
Top 20 percent income				
($N = 17{,}341$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	0.0018	0.0005	−0.0057**
		(0.0034)	(0.0010)	(0.0025)
Bottom 20 percent income				
($N = 8{,}638$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0053	−0.0016	−0.0048*
		(0.0034)	(0.0010)	(0.0026)
"Accurate" and "Reasonable" inflation expectations				
Within one time series std of actual inflation				
($N = 20{,}814$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	0.0084	0.0025	0.0057
		(0.0097)	(0.0029)	(0.0083)
Within one time series std of actual inflation, 2×				
($N = 6{,}551$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	0.0157	0.0044	0.0222
		(0.0184)	(0.052)	(0.0157)
Within 0.5 percentage points of actual inflation				
($N = 8{,}577$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	0.0019	0.0006	0.0379**
		(0.0190)	(0.0056)	(0.0177)
Outside 0.5 percentage points of actual inflation				
($N = 59{,}278$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0010	−0.0003	−0.0048***
		(0.0015)	(0.0004)	(0.0011)
Within 1.28 percentage points of mean inflation expectations				
($N = 22{,}439$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	0.0040	0.0012	0.0019
		(0.0126)	(0.0038)	(0.0098)
Within 1.28 percentage points of mean SPF inflation expectations				
($N = 22{,}061$, Sample: 1984:1 to 2012:12)	Expected inflation (1Y)	−0.0218	−0.0066	−0.0200
		(0.0142)	(0.0044)	(0.0122)

Notes: This table displays estimation results, for a variety of subsamples, described in the column "Specification", using the baseline empirical specification. All of the standard controls from the baseline specification are included in each regression, but their coefficients and standard errors are omitted in the table. Marginal effects at $D_{ZLB} = 1$ are calculated based on the interaction coefficient between expected inflation and the ZLB dummy, which is omitted in the table. The number N in parentheses below each specification description is the number of observations used in the estimation of that specification; there the time horizon of the various samples is also specified. The time series standard deviation of the actual inflation rate (series CPIAUCSL from the St. Louis Federal Reserve Bank database FRED) over the sample horizon 1984:1 to 2012:12 is 1.28 percentage points. Like the baseline specification all these regressions have been run on the subsample of first interviews only. See also notes to Table 1.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

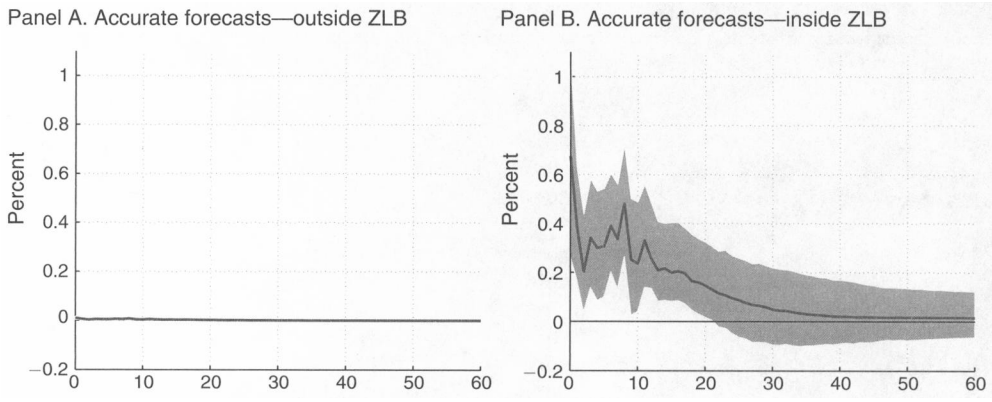

FIGURE 6. IMPULSE RESPONSE FUNCTIONS ON REAL DURABLE CONSUMPTION EXPENDITURES: "ACCURATE" INFLATION FORECASTERS

Notes: This figure shows the impulse response of real durable consumption expenditures from a bivariate VAR with the aggregate index for the buying conditions for durable goods (see Figure 1) ordered first and the HP-filtered (with smoothing parameter $\lambda = 129,600$) natural logarithm of real durable consumption expenditures (see Figure 2) ordered second, where the size of the innovation to the aggregate index is computed, respectively, from the marginal effects of a 1 percentage point increase in inflation expectations focusing on those households whose inflation forecast is within 50 basis points of realized inflation (see the third row of the bottom panel of Table 5), both outside and inside the zero lower bound. The sample period is 1984:1 to 2012:12.

These results focusing on accurate inflation forecasters could have important implications for policy if accurate forecasters account for a large share of all households or a disproportionate share of aggregate durable expenditure. For the former, this is plainly not the case—accurate forecasts as defined in the second row of the bottom panel of Table 5 account for only about 12 percent of total households. For the latter, while our data do not allow us to investigate this possibility formally, there is little anecdotal support for it. Having good inflation expectations is not strongly correlated with education, at least given the coarseness with which the latter is observed in the Michigan Survey. Over the entire baseline sample, 40.5 percent of respondents report having a college degree; conditional on having an ex post accurate inflation expectation there is not a large difference in this fraction (43.9 percent). To the extent to which education is a proxy for income, which in turn is correlated with durable expenditure, there is therefore little reason in our dataset to think that the aggregate implications of higher expected inflation would be significantly influenced by the behavior of accurate or good forecasters.

Table 6 presents the results from the baseline ordered probit run separately on seven different birth cohorts. We define a birth cohort as a decade from 1920–1929, 1930–1939, etc. Additionally, we look at, respectively, respondents born before 1920 and after 1970. This is to test whether the relationship between inflation expectations and spending is different for households that have lived through or were collectively influenced by very different inflationary episodes. The answer is negative: just as for the pooled sample, spending inclinations on household durables are negatively related to inflation expectations for almost all birth cohorts, especially during the zero lower bound period, and the effect is always small in absolute value.

TABLE 6—BASELINE SPECIFICATION: BY BIRTH COHORT

Birth cohort	Coefficient	Marginal effects at $D_{ZLB} = 0$	Marginal effects at $D_{ZLB} = 1$
< 1920 ($N = 2,470$)	0.0004	0.0001	0.0090
	(0.0066)	(0.0010)	(0.0195)
1920–1929 ($N = 4,822$)	0.0031	0.0008	0.0066
	(0.0051)	(0.0013)	(0.0047)
1930–1939 ($N = 6,946$)	−0.0060	−0.0018	−0.0062*
	(0.0048)	(0.0014)	(0.0034)
1940–1949 ($N = 12,478$)	−0.0037	−0.0011	−0.0074***
	(0.0036)	(0.0011)	(0.0026)
1950–1959 ($N = 17,413$)	−0.0018	−0.0005	−0.0067***
	(0.0029)	(0.0009)	(0.0022)
1960–1969 ($N = 14,771$)	−0.0001	−0.0000	−0.0045*
	(0.0032)	(0.0010)	(0.0023)
> 1970 ($N = 8,955$)	−0.0006	−0.0002	−0.0013
	(0.0041)	(0.0011)	(0.0023)

Notes: This table presents separate regressions using only observations from individuals in a particular birth cohort. All of the standard controls from the baseline specification were included in the estimation, but omitted in the table. The number N in parentheses refers to the number of observations in each cohort. The sample runs from 1984:1 to 2012:12, just as in the baseline specification. Like the baseline specification all these regressions have been run on the subsample of first interviews only. See also notes to Table 1.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Finally, Table 7 splits our baseline sample into four inflation expectation quartiles. The inflation expectation quartiles are computed for each month in the sample, then a pooled ordered probit is run on each of these four groups.[21] The average inflation expectation in the lowest quartile is −0.19 percent, 2.64 percent in the second quartile, 4.70 percent in the third, and 9.98 percent in the highest quartile. While the results for quartiles two to four are similar to the baseline results—essentially no effect of inflation expectations on spending readiness—the results for the lowest quartile are different, at least outside the zero lower bound episode. For these households, who on average expect deflation, a one percent increase in expected inflation in the period before 2007 *raises* the probability to have a positive attitude towards spending by about 0.7 percentage points. This result is statistically significant. For households that on average expect deflation, a little more inflation, i.e., a development back towards price stability, evidently is a good economic sign that stimulates demand, at least in normal times. However, during the recent zero lower bound episode, even for this group increased expected inflation has very little effect on spending attitudes.

Together, these results by age, education, income, inflation expectation accuracy/reasonableness, birth cohort, and inflation expectation quartile show that the baseline results are not driven by a specific education group, the ability to

[21] We have also run a version of the baseline specification where we included the square of the inflation expectations term and its interaction with D_{ZLB}, but found almost exactly the same marginal effects as in the baseline specification.

TABLE 7—BASELINE SPECIFICATION: BY QUARTILE OF INFLATION EXPECTATION

Inflation expectation quartile	Coefficient	Marginal effects at $D_{ZLB} = 0$	Marginal effects at $D_{ZLB} = 1$
1. Quartile, 0–25 percent ($N = 20{,}606$)	0.0238***	0.0067***	−0.0002
	(0.0045)	(0.0012)	(0.0027)
2. Quartile, 25–50 percent ($N = 18{,}607$)	0.0014	0.0004	−0.0080
	(0.0174)	(0.0052)	(0.0126)
3. Quartile, 50–75 percent ($N = 16{,}447$)	0.0206	0.0062	−0.0055
	(0.0168)	(0.0051)	(0.0150)
4. Quartile, 75–100 percent ($N = 12{,}195$)	−0.0037	−0.0012	−0.0075**
	(0.0038)	(0.0012)	(0.0030)

Notes: This table presents separate regressions using only observations from individuals in a particular inflation expectation quartile. The inflation expectation quartiles are computed for each month in the sample, then a pooled ordered probit is run on each of these four groups. When the boundary of a quartile was the answer of many respondents, all these respondents were put into the same quartile, which explains the different number of observations, N, across quartiles. All of the standard controls from the baseline specification were included in the estimation, but omitted from the table. The sample runs from 1984:1 to 2012:12, just as in the baseline specification. Like the baseline specification all these regressions have been run on the subsample of first interviews only. See also notes to Table 1.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

borrow (proxied with the results by income), or a specific collective historical inflation experience. It seems to be the case, however, that households that are good or reasonable inflation forecasters—likely those that follow economic news and keep on tap with macroeconomic developments—respond with somewhat bullish buying attitudes to an increase in expected inflation, as would be predicted via the standard Euler equation argument in Section I. These households, however, comprise a relatively small fraction of all households in the survey.

Time Variation.—As a further check, we investigate whether our results change over time. To that end, we estimate our baseline specification with one-year inflation expectations and household durables for each year between 1984 and 2012 and report in Figure 7 the time-varying coefficient on expected inflation (upper panel) as well as its time-varying marginal effect (lower panel). The figures show the point estimates/marginal effects (solid line) together with a 95 percent confidence interval (gray shaded area). The coefficients and marginal effects are rather stable over time. The estimates are always small in absolute value and rarely significantly different from zero. Consistent with our baseline estimates, in most years the coefficient and marginal effect are negative. Interestingly, at the end of the sample (well into the zero lower bound period), if anything the relation between expected inflation and spending readiness has become more negative.

The fact that our results are robust within time periods is comforting. When pooling cross-sectional data across time, one might be concerned that regression coefficients are identified off of "across" time variation rather than "within" time variation. For example, one might worry that respondents in the early part of the sample had, on average, high expected inflation and poor buying attitudes, while in the later part of the sample buying attitudes were better on average and expected

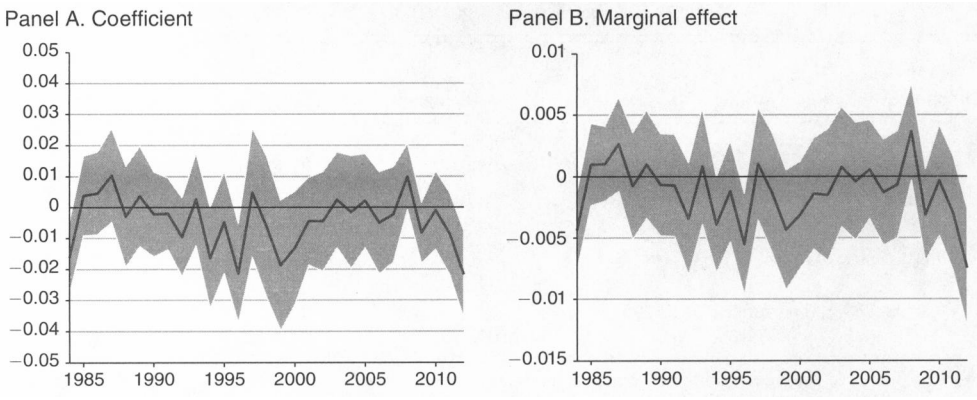

FIGURE 7. TIME-VARYING COEFFICIENT ON EXPECTED INFLATION (1Y) IN THE BASELINE SPECIFICATION COEFFICIENT

Notes: The upper panel plots the estimated coefficient on one-year inflation expectations (β_1) in the baseline specification together with a 95 percent confidence interval for each year, and the lower panel plots the associated marginal effect, along with the 95 percent confidence interval. The marginal effects are computed conditional on the means of the included control variables within that year. We have removed all month-household observations with inflation expectation observations that are larger than 20 percent in absolute value. The sample period is 1984:1 to 2012:12.

inflation lower. This "across" period time series variation would tend to push the estimated correlation between expected inflation and spending attitudes towards the negative, even if the true "within" period correlation were positive. That we find very similar effects focusing on purely "within" time period variation suggests that our results are not plagued by this kind of problem.

V. An Interpretation of the Results and Conclusion

Naturally, caution is in order when using reduced-form results to draw policy conclusions. However, our result that buying attitudes for durable goods are largely unrelated (or negatively related, particularly during the recent zero lower bound period) to expected inflation is pervasive and robust across the majority of US households. In particular, this result is robust across a variety of sociodemographic indicators, such as age, education, and income. It also obtains across birth cohorts, suggesting that having lived through different periods of inflation levels and volatility as well as different monetary policy regimes does not affect the underlying relationship between inflation expectations and spending readiness. A similar conclusion can be drawn from the fact that our results are stable across time. The one exception is the results split by ex post inflation expectation accuracy and ex ante inflation expectation reasonableness, which perhaps suggest that households that are macroeconomically informed behave according to the inflation expectation spending nexus that the Euler equation argument predicts.

Two observations as to the economic mechanisms behind our findings are worth noting: expected future nominal interest rates have a significantly positive effect on spending today, but inflation expectations have a zero to small negative effect. Also, as the online Appendix shows, car loan rates and mortgage rates have a significantly

negative effect on the readiness to buy cars and houses, respectively. We interpret this as consistent with a lack of understanding of the connection between real interest rates, nominal rates, and expected inflation on the part of households, apparently pervasively through education, income, and most other demographic groups. Attanasio and Weber (1993) argue that consumption expenditures do react mildly to real interest rates in microdata. Their analysis does not decompose real interest rates into the nominal rate and expected inflation, however. We do find that buying attitudes are significantly negatively influenced by nominal interest rates (and expectations thereof) in the direction predicted by basic theory when there are limits to arbitrage between long term interest rates and expectations of future short term rates, at least in a qualitative sense. Hence, one interpretation of our results is that they point to the possibility of nominal illusion with respect to interest rates.

However, this does not mean that inflation expectations are not relevant for the spending attitudes of households: when we no longer control for the other idiosyncratic expectations, including the economic policy trust variable, inflation expectations do impact households' spending attitudes significantly in the negative direction, both inside and outside the zero lower bound. This is at least consistent with, if not dispositive of, a Volcker-Taylor view that high inflation portends bad and uncertain economic times.

To the extent that we find significantly negative effects from inflation expectations to spending attitudes, our results are also consistent with a negative wealth effect from an expected inflation tax à la Aruoba and Schorfheide (2011), or nominal wage rigidities that are pervasive enough to cause negative wealth effects through inflation, which are not completely controlled for by the expectation variables in the Michigan Survey. Also, it seems to be the case that inflation expectations for the overall population are partially driven by their gas price expectations, the increase of which would work like a negative supply/wealth shock.

All these results taken together at least intimate that the lack of a positive relationship between inflation expectations and spending readiness for a large number of US households is perhaps indeed a structural property of the US economy. While we are of course aware that our reduced-form results are potentially subject to the Lucas critique, using the best data available we nevertheless think that these results tell a cautionary tale about the notion that stabilization policy at the zero lower bound should attempt to generate inflation expectations to lower real rates and stimulate spending. At the very least, they suggest that the monetary authority would have to overcome a tough communication or education problem, in that it would have to convince the (on average uninformed) public that higher inflation for the foreseeable future is actually a good macroeconomic development. It would have to convince the public that higher inflation is associated with better business conditions and lower unemployment in the future, both factors that we do find to matter substantially for spending attitudes.

Finally, it should be noted that our results do not invalidate per se the underlying macroeconomic models, in particular the canonical Fisher and Euler equations, on which the policy recommendations in favor of engineering higher inflation expectations are based. For example, it could very well be that consumers have not yet understood the new policy regime at the zero lower bound, having a conventional

forward-looking Taylor rule in their minds when they think about the consequences of higher expected inflation. A recent paper that applies our methodology to the case of Japan, an economy with a much longer experience with zero nominal policy interest rates, indeed finds more support for a positive nexus between inflation expectations and spending (see Ichiue and Nishiguchi 2013). Also, the US economy has now for some time experienced a period of low inflation and low inflation volatility, which means that what we interpret as nominal illusion with respect to interest rates could really be the result of a lack of salience of inflation for most economic decisionmakers, perhaps due to limited information processing capacities and rational inattention. This view is at least consistent with our results about the macroeconomically (un)informed. In other words, it could be that if monetary policy actually inflated and continued to credibly commit to higher inflation in the future, not only would inflation expectations readjust, but also the usual Fisherian logic might reappear. A final possibility could be that the envisioned channel—inflation expectations generating aggregate demand—works through investment rather than consumption expenditures, perhaps because decisionmakers in firms are better informed about macroeconomic developments than private households.

Appendix: Survey Questions Used

Q1: (*A18*)[22] *"About the big things people buy for their homes—such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or a bad time for people to buy major household items?"*

Q2: (*A12b*) *"By about what percent do you expect future prices to go (up/down) on the average, during the* next *12 months?"*

Q3: (*A13b*) *"By about what percent* per year *do you expect prices to go (up/down) on the average, during the* next *5 to 10 years?"*

Q4: (*A3*) *"Now looking ahead—do you think that* a year from now *you (and your family living there) will be* better off *financially, or* worse off, *or just about the same as now?"*

Q5: (*A14*) *"During the next year or two, do you expect that your (family) income will go up* more than prices *will go up,* about the same, *or* less than prices *will go up?"*

Q6: (*A11*) *"No one can say for sure, but what do you think will happen to* interest rates *for borrowing money during the next 12 months—will they go up, stay the same, or go down?"*

[22]The IDs beginning with the letter "A" are those used by the Michigan Survey.

Q7: (*A4*) *"Now turning to business conditions in the country as a whole—do you think that during the next 12 months we'll have* good *times financially, or* bad *times, or what?"*

Q8: (*A8*) *"Looking ahead, which would you say is more likely—that in the country as a whole we'll have continuous good times* during the next 5 years *or so, or that we will have periods of widespread* un*employment or depression, or what?"*

Q9: (*A10*) *"How about people out of work during the coming 12 months—do you think that there will be* more un*employment than now, about the* same, *or* less*?"*

Q10: (*A2*) *"We are interested in how people are getting along financially these days. Would you say that you* (*and your family living there*) *are* better off *or* worse off *financially than you were* a year ago?"

Q11: *"To get a picture of people's financial situation we need to know the general range of income of all people we interview. Now, thinking about* (*your/your family's*) *total income from all sources* (*including your job*), *how much did* (*you/your family*) *receive in the previous year?"*[23]

Q12: (*A9*) *"As to the economic policy of the government—I mean steps taken to fight inflation or* un*employment—would you say the government is doing a good job, only fair, or a poor job?"*

Q13: (*A23a*) *"What do you think the chances are that your* (*family*) *income will increase by more than the rate of inflation during the next five years or so?"*

Q14: (*A23b*) *"During the next 5 years, what do you think the chances are that you* (*or your husband/wife*) *will lose a job that you wanted to keep?"*

Q15: (*A20c*) *"About how many cents per gallon do you think gasoline prices will* (*increase/decrease*) *during the next twelve months compared to now?"*

Q16: (*A19*) *"Speaking now of the automobile market—do you think the next 12 months or so will be a good time or a bad time to buy a vehicle, such as a car, pickup, van or sport utility vehicle?"*

Q17: (*A20a*) *"About how many cents per gallon do you think gasoline prices will* (*increase/decrease*) *during the* next five years *compared to now?"*

Q18: (*A16*) *"Generally speaking, do you think that now is a good time or a bad time to buy a house?"*

[23] This question does not have an ID in the Michigan Survey.

Q19: (*A22b*) *"What do you think will happen to the prices of homes (like yours) in your community over the next 12 months? Will they increase at a rapid rate, increase at a moderate rate, remain about the same, decrease at a moderate rate, or decrease at a rapid rate?"*

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