HOUSEHOLD INFLATION EXPECTATIONS AND CONSUMER SPENDING: EVIDENCE FROM PANEL DATA

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Abstract—Recent research offers mixed results concerning the relationship between inflation expectations and consumption, using qualitative measures of readiness to spend. We revisit this question using survey panel data of actual spending from the United States between 2009 and 2012 that also allows us to control for household heterogeneity. We find that durables spending increases with expected inflation only for selected types of households while nondurables spending does not respond to expected inflation. Moreover, spending decreases with expected unemployment. These results imply a limited stimulating effect of inflation expectations on aggregate consumption, which could be reversed if inflation and unemployment expectations move together.

I. Introduction

The relationship between household inflation expectations and consumer spending holds important implications for monetary policy, particularly within an environment in which the zero lower bound (ZLB) on the monetary policy interest rate target is binding. During an earlier period in which the ZLB was binding in the United States (December 2008–November 2015), various economists called for the Federal Reserve to commit to policies that would raise expectations of future inflation, causing a decline in the real interest rate and thereby encouraging greater spending in the present. In March 2020, four years after that ZLB period ended, the United States reverted back to the ZLB in response to the novel coronavirus pandemic and maintained that stance through March 2022 before the FOMC commenced upon a series of rate hikes. Furthermore, estimates of the natural real rate of interest declined considerably in the years following the Great Recession (Holston, Laubach, & Williams, 2017; Del Negro et al., 2018), suggesting that the ZLB may become binding more frequently in the long run (Kiley & Roberts, 2017). Even in countries such as Japan, which have instituted negative nominal interest rates, the debate over the use of inflation expectations as a tool for economic stimulus remains very much alive (Hogen & Okuma, 2018).

This paper examines the relationship between household inflation expectations and actual spending on durable goods and, separately, on nondurable goods and services. We make use of a unique panel data set pertaining to U.S. households surveyed between mid-2009 and late 2012, when the U.S. federal funds target rate remained at its lower-bound range of 0 to 0.25%. We find that higher inflation expectations stimulate current consumption spending on durable goods for consumers who have at least some college education, whereas noncollege households exhibit a null or negative response of spending and are significantly less likely to purchase durables as their inflation expectations increase. In particular, a 1 percentage point increase in the household’s one-year-ahead inflation expectation increases durable goods spending by about 21% for the immediate quarter among households with a college-educated respondent and by 39% if the household also has a mortgage. The corresponding values (although imprecisely estimated) are −15% and 12% among households without any college education. We observe practically no effect on consumption of nondurable goods and services for any type of household.

In sum, the stimulating effect of inflation expectations applies only to spending on durable goods and only to select groups. We estimate that the increase in aggregate spending following a 1 percentage point increase in inflation expectations across all households would be limited to 1.8% or less in a single quarter. We also observe a strong negative relationship between unemployment expectations and consumption that applies broadly across types of households and types of spending. Therefore, any positive effects of inflation expectations on consumption may be more than offset if higher inflation expectations are accompanied by higher unemployment expectations. Such co-movement of expectations has been documented by Kamdar (2019), and such offsetting effects are consistent with Coibion et al. (2019).

The previous literature offers mixed findings on the relationship between household inflation expectations and consumption, typically using microeconomic survey data capturing readiness to spend qualitatively rather than the actual spending level. Bachmann, Berg, and Sims (2015) observe either no relationship or, when the ZLB was binding, a negative relationship between household inflation expectations and readiness to spend on durable goods using the cross-sectional Michigan Survey of Consumers. Binder (2017) also uses the Michigan Survey data and confirms the finding of Bachmann et al. (2015) after controlling for inflation uncertainty, although she does not study the ZLB period separately. Coibion et al. (2019) observe sharply negative effects of inflation expectations on durable goods spending among Dutch households—and modest negative effects on overall spending—where inflation expectations were manipulated experimentally within a consumer survey. In contrast,
Duca-Radu, Kenny, and Reuter (2021) use cross-sectional survey data from the euro area to document that higher expected inflation boosts readiness to spend in a ZLB environment. D’Acunto et al. (2019) find that among Finnish men, only high-IQ individuals display a positive relationship between inflation expectations and the readiness to purchase durables. Two related papers on German and Polish consumers (D’Acunto, Hoang, & Weber, 2016, 2018, respectively) find that an unexpected announcement of an increase in the consumption tax boosts inflation expectations and readiness to spend on durables by economically significant amounts.

A few other studies consider effects on actual spending rather than on the readiness to spend. Ichiue and Nishiguchi (2015) and Dräger and Nghiem (2021) both present evidence of a stimulating effect of inflation expectations on actual household spending, albeit in qualitative terms. The former study finds that Japanese consumers with higher inflation expectations were more likely to report that their household had increased its real total spending compared with one year prior. The latter study, based on survey data from Germany, observes that individuals with higher inflation expectations were more likely to say that their household’s total current spending—defined as spending in the preceding twelve months—was higher than in an average year. Rondinelli and Zizza (2020) find a small but statistically significant positive effect of inflation expectations on actual total spending by Italian consumers in the high-inflation regime of the early 1990s, using survey data that capture within-household differences across two points in time. Crump et al. (2019) use panel survey data from the United States and find that households respond to an increase in their inflation expectations by planning to reduce consumption growth, implying a willingness to reduce future consumption relative to today’s consumption but not necessarily increase their current consumption in absolute terms.

Our panel data on household-level spending and economic expectations, which were assembled using two separate modules of the RAND American Life Panel survey (RAND-ALP), offer several advantages that help us reconcile the seemingly conflicting evidence in the literature: (a) the spending measures refer to actual spending levels (based on one-month or one-quarter recall) rather than to hypothetical spending readiness, planned spending changes, or one-year recall of spending changes; (b) the data enable us to test the response of spending on nondurable goods and services separately from the response of durable goods spending and to estimate responses along both the discrete and continuous margins; (c) the panel aspect allows us to control for unobserved heterogeneity across households that might affect inflation expectations and spending simultaneously; and (d) we assess heterogeneity in behavior along new dimensions, including mortgagor status and other financial indicators, to reveal additional information about the mechanisms by which inflation expectations might influence spending. The data contain a rich set of controls for other economic expectations that could confound our estimates, including expectations of unemployment, nominal interest rates, own wages, house prices, and measures of the uncertainty surrounding both inflation expectations and wage expectations.

For policy purposes, the ability to test the microeconomic spending response for both durable goods and nondurable goods and services is critical because, ultimately, policymakers care about stimulating total consumer spending, of which spending on durable goods forms a relatively small portion—just above 10% on average during the time period covered in our data. Some of the studies listed above have offered estimates of the effects of inflation expectations on aggregate spending, but using only indirect or qualitative methods, or both. The ability to assess whether household financial conditions—including monthly housing and car payments, mortgagor status, household income, and outstanding mortgage balances—mediate the response to inflation expectations also carries a high degree of policy relevance. For example, theory suggests that net debtor households, as opposed to net savers, should be more likely to increase spending in response to a decline in the real rate, such as would follow an increase in inflation expectations at the ZLB. Our finding that lower-income households’ spending is more sensitive to inflation expectations conforms to this notion, to the extent that such households are more likely to be net debtors. As another example, higher inflation expectations erode the real value of nominal debts, suggesting that households with greater nominal debt should experience a more positive consumption response. Consistent with this argument, we find that having a higher mortgage balance amplifies the consumption response to inflation expectations.

Research suggests that inflation erodes consumers’ standard of living (Shiller, 1996), and consumers may associate higher inflation with greater economic uncertainty (Volcker, 2011; Mackowiak & Wiederholt, 2012). More recent studies suggest that consumers may associate higher inflation with higher unemployment (Coibion, Gorodnichenko, & Kamdar, 2018; Kamdar, 2019). We find that expecting an increase in unemployment is associated with a large negative impact on spending on durable goods (and a modest negative impact on spending on nondurable goods and services) for all types of households. Therefore, policies that seek to stimulate spending via inflation expectations may actually be ineffective or even counterproductive if consumers’ expectations of higher inflation tend to concur with their expectations of weaker economic conditions. This finding may also explain the seemingly opposite conclusions derived from randomized information treatments (Coibion et al., 2019) as opposed to natural experiments with consumption tax (D’Acunto et al., 2016). In particular, when an increase in inflation expectations stems from news about inflation, it may also lead to a

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2This calculation is based on personal consumption expenditures data from the Bureau of Economic Analysis, accessed using the Federal Reserve Bank of St. Louis’s FRED online database, https://fred.stlouisfed.org/

3For example, Duflo et al. (2006, 2007) present evidence to this effect.
more pessimistic outlook, whereas replacing a less efficient tax with a consumption tax need not have the same side effect.

Broadly speaking, our results are not quite as pessimistic as those of Bachmann et al. (2015) concerning the effectiveness of policies to stimulate spending via inflation expectations. The measure of optimism we obtain stems from results along the continuous margin of durable goods spending, which differs from the qualitative readiness-to-spend measure of the Bachmann et al. study. Another important difference is that our panel data allow us to control for household-level heterogeneity. Including these controls strengthens the positive relationship between inflation expectations and durables spending, especially among college-educated mortgagor households.

At the same time, we obtain less support in the aggregate for such policies than do some studies based on European or Japanese data. This comparatively weak response on average may reflect the fact that our data coincide with the early years of the recovery from the Great Recession, as prior evidence suggests that following that recession, durable goods consumption in the United States was less sensitive to real interest rates than in previous recoveries (Van Zandweghe & Braxton, 2013).

The remainder of the paper is organized as follows. Section II reviews the basic theoretical predictions concerning the relationship between inflation expectations and current spending. Section III describes the data, section IV describes the empirical setup, section V presents the results, section VI discusses aggregate policy implications, and section VII concludes with an assessment of our findings in the context of the related literature.

II. Consumption Spending and Inflation Expectations

At the heart of the academic and policy discussions on this topic lies the prediction that an increase in expected inflation—all else constant—should boost current consumption relative to future consumption. This prediction draws on the Fisher equation, which approximates the real rate of interest as the difference between the nominal interest rate and the expected inflation rate. In the standard intertemporal choice framework, a decline in the real interest rate leads to a lower return to savings and encourages substitution toward present consumption relative to future consumption, regardless of whether the decline in the real rate occurs because of a decline in the nominal interest rate or because of an equivalent increase in expected inflation (Coibion et al., 2019). Purchases of large consumer durables should be particularly sensitive to real interest rates because such purchases are easily substituted across time and are often financed with debt (see, e.g., Bachmann et al., 2015).

However, an exogenous increase in expected inflation may fail to boost current consumption for a number of reasons. Even in the standard intertemporal choice model, the net effect of a decline in the real interest rate on current consumption—achieved by either reducing the nominal rate or raising expected inflation—depends on the consumer’s net asset position. Among net savers, a decline in the real rate yields a negative wealth effect that may more than offset the positive substitution effect, in which case both current and future consumption would decline. Among net debtors, a lower real rate should boost current consumption, as both wealth and substitution effects would be positive. For households with high nominal debt, higher inflation expectations may erode the real value of debt, boosting consumption through a real wealth effect (as in Fisher, 1933). Nevertheless, borrowing constraints could limit the effectiveness of changes in inflation expectations, just as such constraints could limit the effectiveness of forward guidance on interest rates (McKay, Nakamura, & Steinsson, 2016).

Furthermore, an increase in expected inflation may not be equivalent to a decline in nominal borrowing rates in terms of its impact on intertemporal substitution of consumption. For example, equivalence fails if the consumer’s future income is not fully indexed to inflation. In this case, an increase in expected inflation has ambiguous effects on current consumption for both net savers and net debtors alike, whereas income indexation has no bearing on the effect of a decline in the nominal rate. Financial literacy may also play a role in consumers’ ability to detect movements in real interest rates, such that households with more education, if this confers greater financial literacy, may exhibit a stronger spending response to expected inflation.

There are a number of other reasons why inflation expectations may operate differently than nominal interest rates in terms of their impact on current consumption. Mackowiak and Wiederholt (2012) show that in a model with dispersed information, a commitment by policymakers to higher inflation may send negative signals about the future outlook for the economy, thereby reducing current consumption. In a related vein, Kamdar (2019) finds that consumers’ expectations of inflation and unemployment tend to move in the same direction, according to whether underlying consumer sentiment is positive (promising expectations of lower unemployment and lower inflation) or negative (having the opposite effect).

Given these considerations, previous macroeconomic evidence that real aggregate spending responds positively to a decline in nominal rates need not apply to the question of whether attempts to boost inflation expectations would similarly stimulate spending. Instead, the latter question should be treated as a separate and fundamentally empirical matter that could yield different answers in different economic environments. Based on this discussion, we motivate a reduced-form model that can capture heterogeneous responses to

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4In this scenario, higher expected inflation reduces real future income for both net borrowers and net savers. Among borrowers, this effect may more than offset the positive real wealth effect of higher expected inflation.

5Christiano, Eichenbaum, and Evans (2005) and Bernanke and Gertler (1995) exploit nominal interest rate shocks to identify effects of real rate movements on real spending and find that unexpected declines (increases) in policy rates are associated with significant increases (declines) in real spending.
inflation expectations depending on households’ characteristics. We start with the description of our data in the next section and discuss our econometric approach in section IV.

III. Data Sources and Descriptive Statistics

A. Spending Data

Our spending data and some of the associated control variables pertain to U.S. households that responded to monthly spending modules that were fielded as part of the RAND-American Life Panel (RAND-ALP) Financial Crisis Surveys between May 2009 and January 2013. The RAND-ALP is an Internet panel survey covering the U.S. population ages 18 and over. It does not suffer from selection based on Internet access because subjects are provided with such access if needed. The spending modules ask the respondent about recent spending for the entire household on specific items. For the period we observe, each survey elicited spending during the previous calendar month on a list of frequently purchased items such as food and personal services, and the once per calendar year survey also asked about spending on durable goods (such as refrigerators and furniture) in the previous calendar quarter. Selected screenshots and the text of the relevant survey questions are provided in appendix J.

We construct three dependent variables referring to different measures of spending: one-quarter spending on a bundle of durable goods, one-month spending on a bundle of nondurables goods and services, and a binary variable indicating whether the household purchased any durable goods in the given quarter. The bundle of durable goods includes refrigerators, stoves and ovens, washers and dryers, dishwashers, televisions, computers, and home furnishings such as furniture, carpeting and rugs, and small appliances. The survey also asked about automobile purchases, but we do not include these in our spending measures because the incidence of car purchases is very low and the data exhibit irregularities. The nondurables and services bundle includes food, clothing, utilities, and a variety of other items—not including housing payments or debt service payments—which are listed in full in table A1 of appendix H. We separate the spending categories for two reasons. First, spending on durable goods is expected to respond more strongly to real interest rates than is spending on nondurable goods and services (see, for example, Bachmann et al., 2015). Second, given the structure of the data, it is impossible to construct a measure of total spending at either the monthly or quarterly frequency without engaging in extensive data imputation.

The spending modules also contain information on a variety of demographic and financial indicators that we use as explanatory factors and controls. For example, we observe age, race, sex, and educational attainment, which we divide into two groups based on whether the respondent had at least some college education. Households in which the respondent has at least some college are referred to as “college-type households,” and those with no exposure are called “noncollege households.” The spending modules also report whether the household owns a home, whether it has a mortgage, the total remaining amount owed on a mortgage if relevant, monthly mortgage payments and/or housing rental payments, and monthly payments on automobile loans and/or leases. We combine the housing and car payments into a single “monthly payments” variable that may be indicative of a household’s debt service burden.

B. Expectations of Inflation and other Economic Conditions

The data on respondents’ expectations of price inflation, wage growth, unemployment, interest rates, and household income are drawn from responses to the New York Fed minimodule on household expectations that was appended to the RAND-American Life Panel (ALP) between May 2008 and November 2012, at a roughly six-week frequency (Armantier et al., 2013; Bruine de Bruin et al., 2011). These modules represent a precursor to the New York Fed’s Survey of Consumer Expectations (described in Armantier et al., 2017), which uses similar methods of eliciting inflation expectations. As described in Bruine de Bruin et al. (2011), the survey elicits density forecasts for price and wage inflation by asking respondents to assign probabilities to predetermined intervals for one-year-ahead changes in the general price level and in own (same-job) wage earnings, such as going up by 0% to 2%, going down by 0% to 2%, and so on. The density forecasts are used to construct individual measures of the central tendency and of uncertainty for general price inflation and for same-job wage growth. For the central tendency, we use the density median, and for uncertainty, we use the interquartile range. For a description of the methods used to construct the density medians and interquartile ranges, see appendix A.)

The expectations survey elicited (at the one-year-ahead horizon) quantitative expectations of house price changes as point estimates and qualitative expectations of movements—up, down, or no change—in unemployment and interest rates for borrowing money, where we assume the latter are interpreted as nominal interest rates. The survey also elicited expectations of other economic outcomes, but due to high nonresponse rates, we do not include them in our models. Annual household income, as a discrete range, was also reported in the expectations modules. We converted each range to a point value using the midpoint of the given range or, for those in the top-coded category of $200,000 or more, income was set to $237,500. (For the text of all relevant survey questions see appendix J.)

6For more information on the RAND-ALP Financial Crisis Surveys, see Hurd and Rohwedder (2012), and visit https://www.rand.org/research/data/alp.html.

7The survey also elicits point forecasts of price inflation and own-wage growth, which we do not use. Bruine de Bruin et al. (2011) find that within respondents, the point forecast of expected inflation agrees closely with the median of the density forecast for future inflation.
C. Constructing the Merged Sample

There is substantial overlap between the set of respondents to the ALP spending modules and the ALP/New York Fed expectations modules, enabling us to create an unbalanced panel data set containing matched observations of economic expectations, household spending (either durables or nondurables and services), and the control variables described above. (For details on how the two data sets were merged, see appendix A.) In order to control for wage growth expectations, we retain only observations in which these expectations are not missing, and so our results are applicable to households in which at least one individual (the respondent) is employed. To be included in the panel for either type of spending, the respondent must have at least three observations with nonmissing values for all relevant variables. For the durables goods spending panel, respondents must have purchased durables in at least one of their observations, and for the nondurables, panel observations involving no spending are excluded. The remaining sample restrictions are described in appendix A.

Following the matching and sample selection procedures, the baseline durable goods spending sample consists of 1,084 household-quarter observations spanning the time period 2009Q4 to 2012Q4, and the nondurable goods and services spending sample contains 2,010 household-month observations spanning November 2009 to November 2012. The (unweighted) average number of observations per household is 6.5 in the quarterly (durables) panel and 10 in the monthly (nondurables) panel. Researchers at RAND supplied us with a separate set of weights for each of these panels, such that a given household’s weight is constant over time within each. Weights were calibrated to match the distribution of various demographic characteristics (including age-by-sex, race-by-sex, and household-size-by-income) of the 2012 Current Population Survey. For weighting purposes, age was set to a respondent’s age as of 2012. Sample weights are used in all descriptive statistics and regression analysis.

D. Summary Statistics

Table 1a shows the weighted summary statistics of the key dependent and independent variables for our two main regression samples. Columns 1 through 4 pertain to the baseline sample for durable goods spending, and columns 5 through 8 pertain to the baseline sample for nondurable goods spending. All dollar values are expressed in January 2012 dollars. Table 1b provides analogous summary statistics restricted to the mortgagor subsample, which we study separately in order to analyze the effect of mortgage balances. Comparing

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8Some individuals reported being both retired and employed, as these categories are not mutually exclusive. We retain these observations, although results are robust to excluding them.

9For both the durables and the nondurables panels, the date range of the observations employed in the regressions is narrower than the full date range of the spending surveys reported in section IIIA. This occurs as a result of the procedures for matching the spending data and the expectations data, as described further in appendix A.
the quarterly frequency (see figure A1 of appendix H). However, the sample median expectations from the nondurables sample, when aggregated to the quarterly frequency, closely resemble those from the durables sample, as seen in figure A2 of appendix H. Furthermore, results are robust to omitting months with unusually high median inflation expectations, as shown in appendix G and tables A5 to A10 of appendix H.

Expectations of other economic outcomes, such as wage growth, appear reasonable in relation to real-world data, although the unemployment expectations in our data appear somewhat pessimistic relative to the actual experience in the United States at the time. (See appendix D for further discussion of the external validity of these other economic expectations.)

### IV. Empirical Estimation

#### A. Model Specification and Estimation Procedures

Our goal is to estimate the response of current consumption outcomes—either a continuous spending measure or the chance of purchasing durable goods—to changes in expected inflation and other factors. As discussed in section II, we follow the previous literature and adopt approximate
The durable goods bundle from the regression sample includes large and small appliances, furniture, floor coverings, televisions, computers, and miscellaneous household equipment. The durable goods bundle from the Consumer Expenditure Survey (CES) includes large and small appliances, furniture, floor coverings, miscellaneous housewares, and miscellaneous household equipment. The nondurable goods bundle from the regression sample includes food, electricity, water, heating fuel, phone and cable TV services, gasoline, personal care goods and services, health care services, medical supplies, prescription drugs, clothing, entertainment, hobbies and leisure equipment, house cleaning goods and services, gardening goods and services, and other child spending. The nondurable goods bundle from the CES includes food, utilities/fuels/public services, gasoline/motor oil, personal care goods and services, health care services, medical supplies, prescription drugs, apparel and related services, entertainment, pets/boys/hobbies/playground equipment, laundry and cleaning supplies, household operations, and other household products. Due to a lack of observations of durable goods spending in selected quarters (2009 and 2011) and of nondurables spending in selected months (all years), we impute spending for the missing quarters or months in order to compute annual spending values. See appendix C for details of these imputations.

Median inflation expectation refers to the median one-year-ahead inflation expectation for the given quarter, based on the dates on which subjects completed the expectations surveys.

The main explanatory variable of interest is the inflation expectation, $E_i[\pi_{t+1}]$. The other observed explanatory factors, captured by the vector $X_i$, include expectations of own...
wage growth, unemployment, interest rates and house prices, inflation forecast uncertainty and wage growth forecast uncertainty, demographic characteristics (having at least some college education, gender, race, and age), and household financial factors including annual income, owning a home, having a mortgage, combined monthly payments on housing and cars, and, in the mortgagor-only sample, the remaining mortgage balance. The term \( \mu_i \) represents a fixed household-level effect that is additive on the log of mean spending. Time dummies (for the quarter or month) are included in all models.

Using the GEE approach with the Poisson specification addresses the skewness of spending by means of the log transformation, but unlike a standard log-linear model, it is robust to heteroskedasticity and can accommodate zero spending values without requiring adjustments that could introduce distortions. The estimation is implemented using quasi-maximum likelihood (QMLE) with robust standard errors. The resulting estimators are consistent (and asymptotically normal) as long as the conditional mean is correctly specified, even if the data do not exhibit the Poisson property that the conditional variance equals the conditional mean (Wooldridge, 2010; Zeger et al., 1988).

We proxy for the fixed unobserved heterogeneity at the household level using correlated random effects (Wooldridge, 2019; Mundlak, 1978). This method assumes that the heterogeneity can be captured as a linear function of the within-household means of the complete set of time-varying explanatory variables, and that after including the within-household means as added regressors, strict exogeneity holds. That is, conditional on the fixed heterogeneity in spending, the residual spending within a household is taken to be uncorrelated with the explanatory variables from all time periods. (For more details on the estimation method, refer to appendix E.)

In the most comprehensive models, we also include interaction terms between the inflation expectation and each of (a) the dummy variable for no college exposure, (b) the within-household mean of log annual income, (c) the within-household average of the monthly payments, (d) the within-household average mortgage indicator, and, in the mortgagor sample, the (e) within-household mean of the mortgage balance. These interactions aim to capture factors that might mediate the response of spending to changes in expected inflation. For example, households with more education may have greater financial literacy or better cognitive abilities, or both, either of which would predict a better understanding of inflation and real interest rates and therefore a stronger spending response to expected inflation. Households with lower income might have a more positive consumption response, to the extent that they are more likely to be net debtors. Mortgagor households with higher mortgage balances (controlling for income) are expected to react more positively than those with lower balances, based on real wealth effects. Having higher payments on housing and cars (again controlling for income) could limit a household’s ability to borrow further, and so might inhibit the household’s spending response to an increase in expected inflation.\(^\text{10}\) In alternative models (discussed in appendix G) we include additional controls, other interaction terms, and lagged inflation expectations. (For detailed descriptions of all explanatory variables, see table A2 of appendix H.)

We use the same basic model for spending on durable goods as well as for spending on nondurables and services. The latter data contain no zeroes, but they also exhibit significant skewness. To estimate models of purchasing any durable goods, we again adopt the GEE approach with correlated random effects, but employing a logit specification instead of Poisson.

**B. Identification**

Identification of the coefficient on the inflation expectation requires that within-household changes in expected inflation be strictly exogenous in the time-varying idiosyncratic shocks to spending within a household. As our data do not exploit a natural experiment, we can only claim to rely on quasi-experimental variation in inflation expectations. We control for what we believe are the most important potential confounders of the effects of inflation expectations on spending, including household-level heterogeneity, expectations of economic factors other than inflation, household-level financial conditions, aggregate shocks (via time dummies), and, in extended models, region fixed effects and regional gas prices. Controlling for household-level heterogeneity addresses identification concerns to a significant degree, because a study that links similar survey data on inflation expectations with an economic experiment finds that respondents adjusted their behavior reasonably in the experiment as their inflation expectations changed organically over time (Arman-tier et al., 2015).

Movements in oil prices have been found to exert a significant influence on consumers’ inflation expectations (Coibion & Gorodnichenko, 2015). As seen in figure A6 (appendix H), quarterly median inflation expectations in our sample roughly track four-quarter changes in U.S. retail gas prices, at least between 2009Q4 and 2011Q4. Since changes in gasoline prices could affect real spending on nongasoline items, as in Gelman et al. (2017), it may be important to control for gas price inflation. Time dummies will control for national gas prices per time period, but gas price movements could vary regionally. Therefore, as described in appendix G, we include regional gas price inflation as an additional control variable as a robustness check.

Our approach requires that, conditional on the included controls, the revisions to households’ inflation expectations occur in response to factors that do not also directly affect their current consumption decisions. For example, a

\(^{10}\)The interactions use the within-household mean of a given factor because we are unlikely to detect within-household variation in the response to inflation expectations at, say, slightly different values of their mortgage balance in different (but nearby) time periods.
household member might hear a friend complain that inflation is too high or that prices are going up, and this might cause him to raise his own expectation of inflation, but the friend’s complaint should not directly affect his own spending decision. Reading a newspaper article about a recent increase in actual headline inflation or about an increase in the Federal Reserve’s latest forecast of inflation might have a similar effect of raising an individual’s expectations of future inflation, and again (conditioned on the time dummies and other controls) such information should affect current spending only insofar as it affects the household’s inflation expectations.

Identification also requires that there be no reverse causality from spending to inflation expectations. Reverse causality might occur, for example, if a household notices an increase in its nominal spending on a given basket of goods—caused by recent inflation in the prices of those goods—and this recognition causes members of the household to raise their expectations of future inflation. In addition to including time dummies to control for aggregate inflation, we control for reverse causality by deflating nominal spending values to obtain real spending values, as described in table A1 (appendix H). and matching the data so as to reduce the possibility that expectations were formed after the spending took place.

V. Results

A. Durables Goods Spending on the Continuous Margin

The first 6 columns of table 2 show the results of models of durable goods spending estimated over the baseline sample. The models in columns 4 to 6 include the within-subject means of the time-varying regressors in order to control for household-level heterogeneity, as explained above. The

All results are robust to using nominal spending values instead of the deflated values.
coefficients on most of the latter variables are suppressed from the tables for compactness. Table A11 (appendix H) shows the coefficients on all included variables.

The coefficients on most variables represent semielastics-

tries, or the percent change in spending for a unit change in the given variable, holding all other covariates fixed. The coefficients on log household income represent elasticities. For expected inflation and inflation uncertainty, a unit change represents 1 percentage point. All variables that enter into interactions have been recentered around their sample-wide means in order to facilitate interpretation of the effects. The joint significance of each regression is indicated by a Wald chi-squared statistic and its corresponding \( p \)-value at the bottom of the table.

Column 1 of table 2 shows results from a standard GEE model, which includes just the inflation expectation and inflation uncertainty, plus a constant term and time dummies. The main coefficient on expected inflation is a small positive value that is not significantly different from 0. Column 2 includes interest rate expectations and real wage growth expectations, wage growth uncertainty, income, demographic characteristics, mortgagor and homeowner status, and column 3 adds unemployment expectations. In these models, which omit the household-level heterogeneity controls, the coefficient on inflation expectations becomes a small negative number, consistent with previous studies that use cross-sectional surveys that do not control for household-level heterogeneity.

Starting with column 4, we introduce within-subject means of the time-varying regressors to control for household-level heterogeneity. The coefficient on inflation expectations remains insignificant; nevertheless, it becomes positive and increases in magnitude. Note that the coefficient on the household-mean inflation expectation is a large negative value, suggesting that households that tend to exhibit higher inflation expectations also tend to spend less money on durable goods. Without this control, the effect of the current inflation expectation is therefore biased downward (compare columns 3 and 4), suggesting that cross-sectional data may underestimate the relationship between inflation expectations and consumption. Moreover, the coefficient on expecting an increase in unemployment becomes more strongly negative, suggesting that the controls for heterogeneity are indeed important.

The coefficients on expected inflation estimated thus far could embed diverse effects for different types of households. Accordingly, the model in column 5 introduces interactions between expected inflation and inflation uncertainty and the no-college indicator. The results reveal a large and statistically significant difference between the durable goods spending responses of these two types of households. The college-educated respondents increase spending on durable goods when their inflation expectations increase (as indicated by the positive coefficient in the top row of column 5), whereas noncollege respondents have a much weaker, effectively null or negative, response (as indicated by the negative and highly significant coefficient on the relevant interaction term). Estimates of average marginal effects by educational attainment, described below, affirm and strengthen the contrast between these groups. This differential response is consistent with previous research that focuses on differences in IQ (D’Acunto et al., 2019) or differences in financial literacy (Dräger & Nghiem, 2021). Nevertheless, appendix G investigates alternative explanations for this pattern.

The model in column 6 is similar to the one in column 5, but introduces interaction terms between the inflation expectation and each of three within-household average characteristics: the average of the monthly payments variable, the average of the non-mortgagor indicator variable, and the average (log) annual household income. The coefficient on the inflation expectation for the college-educated respondents (top row) remains positive and becomes more precise. We also see that households with lower mean incomes tend to react more positively to changes in inflation expectations compared to higher-income households. This result is consistent with the prediction that net debtors should be more likely to increase spending in response to higher inflation expectations because lower-income households are more likely to be net debtors (Duflo et al., 2006, 2007). The interaction between inflation expectations and average monthly payments (not shown) is very small (positive) and insignificant. The interaction with the mean non-mortgagor indicator (not shown) is negative, as predicted if mortgagors experience positive real wealth effects of higher expected inflation, but is small and insignificant. (See table A11 of appendix H for the complete set of coefficient estimates.)

To examine the effect of mortgage balances on the relationship between inflation expectations and durable goods spending, we restrict the estimation to the subsample of respondents who report having a mortgage in each period in which they are observed. Column 7 of table 2 shows results estimated over the resulting mortgagor sample for a model that contains the maximal set of controls and includes an interaction between inflation expectations and the (within-household average) remaining (log) mortgage balance. (The average log mortgage balance and the current log mortgage balance are also included in the model as stand-alone terms.) Among mortgagors, the inflation expectation exhibits a positive association with durable goods spending, but again there is a significant negative interaction between the inflation expectation and the no-college dummy. Consistent with real wealth effects of nominal debt, the coefficient on the interaction between the inflation expectation and the mortgage balance is positive and highly significant.

Table 3 shows estimates of the average marginal effects of inflation expectations on durable goods spending within the baseline sample and the mortgagor sample, respectively, at selected values of key covariates. The results are based, respectively, on the models in column 6 (baseline sample) and column 7 (mortgagor sample) of table 2. All estimates represent average semielasticities, or the average relative increase in spending for a 1 percentage point increase in expected inflation, holding only selected covariates fixed as indicated.
in the leftmost column. The average semi-elasticity of inflation expectations on durable goods spending is small, positive, and not significantly different from 0. However, the estimates imply that the average college-educated respondent increases spending on durables by 21% per 1 percentage point increase in expected inflation, an economically nontrivial and statistically significant value. Consistent with results from table 2 (column 6), the average semi-elasticity for noncollege households has a negative point estimate (−0.15), although the value is not statistically significant.

Table 2 also shows the average marginal effects for households (by college status) at the 25th percentile income and 75th percentile income, respectively, based on the sample-wide distribution of within-household average income. Consistent with the negative interaction coefficient, the semi-elasticities at 25th percentile income are greater than those at 75th percentile income for either college or noncollege types. Among college-educated respondents, the semi-elasticity is positive (0.25) and highly significant at 25th percentile income and becomes not only smaller but also insignificant (0.14) at 75th percentile income, while for noncollege types, both estimates are negative (−0.10 and −0.21, respectively) but neither value is highly significant.

Within the mortgagor sample (column 2 of table 3), the average marginal effect of expected inflation on durable goods spending is positive and statistically significant, but this overall effect appears to be driven by the college types. The average college-educated mortgagor increases spending on durables by an estimated 39% per 1 percentage point increase in expected inflation, while among noncollege types, the corresponding point estimate is smaller (still positive) and statistically insignificant. Having a higher mortgage balance boosts the durable goods spending response considerably: for college types, the semi-elasticity rises from 28%, assuming a mortgage balance at the 25th percentile, to 53% for a mortgage balance at the 75th percentile. Among noncollege mortgagors, the semi-elasticity estimates also increase with the mortgage balance but are statistically insignificant in all cases. The estimated semi-elasticities by income percentile in table 3 (column 2) are consistent with the fact that the income interaction (from column 7 of table 2) is negative and insignificant. The point estimates decline with the income percentile (within either education type) but are positive and significant among college-educated mortgagors at both the 25th and 75th income percentiles.

The results from models of purchasing any durable goods in a quarter are described in appendix F and tables A3 and A4 and figures A4 and A6 of appendix H. The most important results of those models are that for college types in general, the chance of buying durables is unresponsive to inflation expectations; among college-educated mortgagors, the chance of buying durables increases on average with expected inflation; and among those with no college education, the tendency to purchase durables decreases on average with expected inflation.

### B. Spending on Nondurable Goods and Services

Table 4 shows results of GEE models of monthly spending on our bundle of nondurable goods and services that are otherwise similar to the models in table 2—the first six columns refer to models estimated over the baseline sample and the seventh shows results for the mortgagor subsample. (See table A12 of appendix H for all coefficient estimates.) For the baseline sample, nondurables spending is mostly unresponsive to expected inflation, regardless of educational attainment. In the mortgagor sample (column 7), larger mortgage balances are associated with greater increases in nondurables spending for a given increase in expected inflation, but the magnitude of the interaction is much smaller compared to the case of durable goods spending.

The average marginal effects estimates (see table 5) confirm that there is a zero response of nondurables spending to inflation expectations, on average in the baseline sample and separately among both college and noncollege types. However, households with 25th percentile (average) income exhibit a small but statistically significant positive spending response of 2%. Among mortgagors, the average response of nondurables spending is a small and marginally significant negative value (−2%). Also, despite the positive interaction between the mortgage balance and expected inflation in

### Table 3.—Average Marginal Effects of Inflation Expectations on Durable Goods Spending

|                          | Baseline Sample, Model 6 | Mortgagor Sample, Model 7 |
|--------------------------|--------------------------|----------------------------|
| Average                  | 0.04                     | 0.25**                     |
|                          | (0.09)                   | (0.12)                     |
| No College               | −0.15                    | 0.12                       |
|                          | (0.10)                   | (0.16)                     |
| Some College or More     | 0.21**                   | 0.39***                    |
|                          | (0.09)                   | (0.09)                     |
| No College, 25th Percentile | −0.10                   | 0.16                       |
| Household Income         | (0.10)                   | (0.16)                     |
| College, 25th Percentile | 0.25***                  | 0.43***                    |
| Household Income         | (0.09)                   | (0.09)                     |
| No College, 75th Percentile | −0.21*                   | 0.06                       |
| Household Income         | (0.11)                   | (0.18)                     |
| College, 75th Percentile | 0.14                     | 0.33***                    |
| Household Income         | (0.10)                   | (0.12)                     |
| No College, 25th Percentile | 0.01                     | 0.26                       |
| Mortgage Balance         | (0.15)                   | (0.07)                     |
| College, 25th Percentile | 0.28***                  | 0.26                       |
| Mortgage Balance         | (0.07)                   | (0.19)                     |
| College, 75th Percentile | 0.53***                  | 0.15                       |
| Mortgage Balance         | (0.13)                   |                            |
| Observation              | 1,084                    | 671                        |

A given semi-elasticity estimate indicates the population average relative change in quarterly durable goods spending for a 1 percentage point increase in expected inflation one year ahead, assuming the given characteristics. (Percentage changes are obtained by multiplying each value by 100.) Standard errors in parentheses. *p < 0.10, **p < 0.05, and ***p < 0.01.

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12 The average marginal effects are calculated setting the given regressors to the specified values and integrating over the distribution of the remaining regressors in the given sample population. The row labeled “average” gives the overall average marginal effect for the given sample.
TABLE 4.—REAL NONDURABLE GOODS SPENDING VERSUS YEAR-AHEAD EXPECTATIONS, BASELINE SAMPLE (COLUMNS 1–6), MORTGAGOR SAMPLE (COLUMN 7), GEE ESTIMATION

|                          | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     | (7)     |
|--------------------------|---------|---------|---------|---------|---------|---------|---------|
| Inflation Expectation    | 0.002   | 0.002   | 0.003   | 0.003   | −0.001  | 0.003   | 0.027   |
| (0.006)                  | (0.006) | (0.006) | (0.007) | (0.007) | (0.012) | (0.012) | (0.021) |
| Inflation Uncertainty    | −0.004  | −0.002  | −0.000  | −0.003  | 0.016   | 0.012   | 0.021   |
| (0.007)                  | (0.006) | (0.006) | (0.008) | (0.010) | (0.011) | (0.013) |         |
| Household Income (Log)   | 0.419** | 0.409** | 0.116   | 0.118   | 0.124   | 0.124   | 0.012   |
| (0.056)                  | (0.056) | (0.056) | (0.089) | (0.089) | (0.090) | (0.137) |         |
| Expects Unemployment Increase | −0.124*** | −0.125*** | −0.123*** | −0.128*** |          |          |         |
| (0.034)                  | (0.033) | (0.034) | (0.034) | (0.064) |          |          |         |
| Expects Unemployment Decrease | −0.023  | −0.027  | −0.028  | −0.028  | 0.001   |         |         |
| (0.027)                  | (0.027) | (0.027) | (0.027) | (0.047) |          |          |         |
| Mean Inflation Expectation | −0.012 | −0.011  | −0.020  | −0.075** |          |          |         |
| Mean Log Household Income |         |         |         |         |          |         |         |
| Mean Expects Unemployment Increase | 0.201   | 0.206   | 0.233   | −0.311  |          |          |         |
| (0.170)                  | (0.168) | (0.163) | (0.226) |          |          |          |         |
| Mean Expects Unemployment Decrease | −0.039  | −0.045  | −0.047  | 0.039   |          |          |         |
| (0.190)                  | (0.185) | (0.184) | (0.158) |          |          |          |         |
| No College               | 0.011   | 0.020   | −0.112  |          |          |          |         |
| No College × Inflation Expectation | 0.006   | 0.000   | −0.010  |          |          |          |         |
| (0.009)                  | (0.009) | (0.021) |          |          |          |          |         |
| No College × Inflation Uncertainty | −0.030** | −0.026** | 0.005   |          |          |          |         |
| (0.012)                  | (0.011) | (0.020) |          |          |          |          |         |
| Mean Log Household Income × Inflation Expectation | −0.021** | 0.017   | 0.017   |          |          |          |         |
| (0.008)                  | (0.015) |          |          |          |          |          |         |
| Mean Log Mortgage Balance | −0.043  |          |          |          |          |          |         |
| Mean Log Mortgage Balance × Inflation Expectation |          |         |          |          |          |          |         |
| Mortgage Balance (Log)   |         |         |         |          |          |          |         |

| Correlated Random Effects | No  | No  | No  | Yes | Yes | Yes | Yes |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|
| Chi-squared               | 168.47 | 317.43 | 417.65 | 773.60 | 930.76 | 1,224.80 | 1,468.69 |
| p-Value                   | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sample Size               | 2,010 | 2,010 | 2,010 | 2,010 | 2,010 | 2,010 | 579 |

Each column includes time fixed effects. All means refer to within-subject means. Model 1 includes the inflation expectation and inflation uncertainty. Model 2 adds household income (log), monthly payments (log), the “expects interest rate increase” indicator, the “expects interest rate decrease indicator,” the real wage expectation, wage uncertainty, the house price expectation, the no mortgage indicator, respondent’s age, and the indicators for nonwhite, female, retired, and homeowner. Model 3 adds the “expects unemployment increase” indicator and the “expects unemployment decrease” indicator. Model 4 adds the within-subject means of the inflation expectation, inflation uncertainty, household income (log), monthly payments (log), expects interest rate increase, expects interest rate decrease, the real wage expectation, wage uncertainty, the house price expectation, expects unemployment increase, expects unemployment decrease, the no mortgage indicator, and the homeowner indicator. Model 5 adds the no college indicator and the indicator’s interactions with the inflation expectation and inflation uncertainty. Model 6 adds interactions between the inflation expectation and each of within-subject mean household income (log), mean monthly payments (log), and the mean no mortgage indicator. Model 7 is restricted to the mortgagor sample. This model includes the mortgage balance (log), the within-subject mean of the mortgage balance (log), and the interaction between the inflation expectation and within-subject mean mortgage balance. The full set of coefficients is presented in appendix H. Robust standard errors are clustered at the level of the individual respondent. Standard errors in parentheses. *p < 0.10, **p < 0.05, and ***p < 0.01.

VI. Aggregate Policy Implications

Despite our finding that some types of households exhibit a strong durable goods consumption response to an increase in expected inflation, our results do not make a strong case for policies seeking to boost aggregate consumption by engineering higher inflation expectations. The primary reasons are that the effects are limited to durable goods for a subset of the population. Therefore, even if the central bank can engineer a permanent shift in inflation expectations, the effects are likely to be limited.

For example, in the baseline sample, the average effect of a 1 percentage point increase in inflation expectations on consumption is limited to a 4% increase in durables spending in a single quarter, based on the (insignificant) point estimate in table 4 (column 1, top row). The fact that durables account for only 10% of aggregate spending means that aggregate spending in the quarter would increase by just 0.4%. One can boost this estimate by arguing that the effects are strongly positive for college-educated consumers, whereas the negative point estimates for noncollege types can be treated as zeroes given their imprecision. Among college-educated consumers, the model predicts a 21% increase in one-quarter durables spending following a 1 percentage point increase in expected inflation. Based on the typical share of college-type...
behavior of the respondent’s household, we find that some subgroups of the population—especially college-educated mortgagors and, to a lesser extent, college-educated individuals in general—exhibit significantly greater real spending on durable goods when their expectations of one-year-ahead inflation are higher, while noncollege households on average exhibit no or a weakly negative response. Spending on nondurable goods and services is practically unresponsive to inflation expectations. Also, expecting an increase in unemployment is associated with large and robust negative effects on durable goods spending and modest negative effects on nondurables and services spending. We also find that higher household income dampens the effect of inflation expectations on spending, whereas higher mortgage balances amplify it.

Our results shed light on the factors that might enable or inhibit the consumption response to expected inflation. The fact that we only observe significant positive consumption responses among households in which the respondent had at least some college education, while noncollege households may even respond negatively, suggests that cognitive ability or financial literacy may be important mediating factors, consistent with some previous findings. Our result that households with larger mortgage balances respond more positively to increases in their inflation expectations agrees with the prediction that individuals with higher nominal debt loads—all else equal—should respond more strongly to higher expected inflation because inflation erodes the real value of debt and thereby increases real wealth.

Overall, our results help to reconcile some of the conflicting evidence observed across previous studies. Compared with other papers that use data from the United States, our results are qualitatively similar to those of Bachmann et al. (2015) in that we also observe a zero or possibly negative response of durable goods purchases (on the extensive margin) to higher expected inflation. The fact that we observe some positive effects of inflation expectations on durable goods consumption agrees with the results of a few studies of European consumers, although most of the latter studies observed only qualitative measures of readiness to spend.

In sum, we observe evidence of positive effects of inflation expectations on durable goods consumption. Nevertheless, the estimated aggregate effects on total consumption are rather limited. If consumers’ expectations of inflation and unemployment tend to move in the same direction, policies that stimulate inflation expectations may have the unintended consequence of stoking higher unemployment expectations and, as a result, could lead to net reductions in aggregate spending. Therefore, central banks should exercise caution in using inflation expectations as a policy tool.

VII. Conclusion

Using a unique panel data set that matches the inflation expectations of individual respondents with the actual spending households’ durables spending in aggregate spending, we estimate that one-quarter aggregate spending would increase by approximately 1.8%.13

Based on European data, Duca-Radu et al. (2020) estimate that a 2 percentage point increase in expected inflation would lead to a cumulative increase in aggregate spending on the order of 0.36% over a three-year horizon. Translating our optimistic scenario just described to the scale used by Duca-Radu et al., our model predicts a cumulative increase in aggregate spending of 0.30% over a three-year horizon for a 2 percentage point increase in expected inflation. Including lagged effects on spending, which are estimated in appendix G, the corresponding estimate does not change materially, at 0.31%. The fact that we obtain weaker effects in the United States compared with Europe—even in our most generous assessment—could reflect the fact that during our time period following the Great Recession, U.S. households exhibited a relative insensitivity to interest rates compared with earlier recoveries, as observed by Van Zandwegrhe and Braxton (2013).

VII. Conclusion

Using a unique panel data set that matches the inflation expectations of individual respondents with the actual spending

13According to the 2017 Consumer Expenditure Survey households with at least some college education accounted for about 85% of aggregate spending and durables accounted for about 10% of their total spending. Accordingly, the increase in aggregate spending is calculated as 21% times (0.1)(0.85), or 1.8%. This calculation sets the effects on nondurables spending to 0 for both college and noncollege households, based on table 5.

REFERENCES

Armantier, Olivier, Wändi Bruine de Bruin, Simon Potter, Giorgio Topa, Wilbert van der Klaauw, and Basit Zafar, “Measuring Inflation Expectations,” Annual Review of Economics 5 (2013), 273–301. 10.1146/annurev-economics-081512-141510

Table 5.—Average Marginal Effects of Inflation Expectations on Real Nondurables and Services Spending, as Semi-Elasticities

|                        | Baseline Sample, Model 6 | Mortgagor Sample, Model 7 |
|------------------------|--------------------------|---------------------------|
| Average                | 0.01                     | -0.02*                    |
|                       | (0.01)                   | (0.01)                    |
| No College             | 0.00                     | -0.02*                    |
|                       | (0.00)                   | (0.01)                    |
| Some College or More   | 0.01                     | -0.01                     |
|                       | (0.01)                   | (0.01)                    |
| No College, 25th Percentile | 0.02***                  | -0.03*                    |
| Household Income       | (0.01)                   | (0.02)                    |
| College, 25th Percentile | 0.02                     | -0.02                     |
| Household Income       | (0.01)                   | (0.02)                    |
| No College, 75th Percentile | -0.00                   | -0.02                     |
| Household Income       | (0.01)                   | (0.01)                    |
| College, 75th Percentile | -0.00                   | -0.01                     |
| Household Income       | (0.01)                   | (0.02)                    |
| No College, 25th Percentile | -0.03***                | -0.02*                    |
| Mortgage Balance       |                          |                           |
| College, 25th Percentile | -0.02                   |                           |
| Mortgage Balance       |                          |                           |
| No College, 75th Percentile | -0.01                   |                           |
| Mortgage Balance       |                          |                           |
| College, 75th Percentile | 0.00                    |                           |
| Mortgage Balance       | (0.01)                   |                           |
| Observations           | 2,010                    | 579                       |

A given semi-elasticity estimate indicates the population average relative change in monthly nondurable goods and services spending for a 1 percentage point increase in expected inflation one year ahead, assuming the given characteristics. (Percentage changes are obtained by multiplying each value by 100.) Standard errors in parentheses. *p < 0.10, **p < .05, and ***p < .01.
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Armantier, Olivier, Wandi Brune de Bruijn, Giorgio Topa, Wilbert van der Klaauw, and Basit Zafar, “Inflation Expectations and Behavior: Do Survey Respondents Act on Their Beliefs?” International Economic Review 562 (2015), 505–536. 10.1111/iere.12113

Armantier, Olivier, Giorgio Topa, Wilbert van der Klaauw, and Basit Zafar, “An Overview of the Survey of Consumer Expectations,” FRBNY Economic Policy Review (2017), 51–72.

Bachmann, Rudiger, Tim O. Berg, and Eric R. Sims, “Inflation Expectations and Readiness to Spend: Cross-Sectional Evidence,” American Economic Journal: Economic Policy 7:1 (2015), 1–35. 10.1257/ polym.20130292

Bernerke, Ben S., and Mark Gertler, “Inside the Black Box: The Credit Channel of Monetary Policy Transmission,” Journal of Economic Perspectives 9 (1995), 27–48. 10.1257/jep.9.4.27

Binder, Carola, “Measuring Uncertainty Based on Rounding: New Method and Application to Inflation Expectations,” Journal of Monetary Economics 90 (2017), 112. 10.1016/j.jmoneco.2017.06.001

Brune de Bruijn, Wandi, Charles F. Manski, Giorgio Topa, and Wilbert van der Klaauw, “Measuring Consumer Uncertainty about Future Inflation,” Journal of Applied Econometrics 26:3 (2011), 454–478. 10.1002/jae.1239

Christiano, Lawrence J., Martin Eichenbaum, and Charles L. Evans, “Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy,” Journal of Political Economy 113:1 (2005), 1–45. 10.1086/426038

Coibion, Olivier, Yuriy Gorodnichenko, “Is the Phillips Curve Alive and Well After All? Inflation Expectations and the Missing Dissipation,” American Economic Journal: Macroeconomics 7 (2015), 197–232. 10.1257/mac.20130306

Coibion, Olivier, Yuriy Gorodnichenko, and Rupal Kamdar, “The Formation of Expectations, Inflation, and the Phillips Curve,” Journal of Economic Literature 56:5 (2018), 1447–1941. 10.1257/jel.20171300

Coibion, Olivier, Dimitris Georgarakos, Yuriy Gorodnichenko, and Maarten van Rooij, “How Does Consumption Respond to News about Inflation? Field Evidence from a Randomized Control Trial,” NBER working paper 26106 (July 2019).

Crump, Richard K., Stefano Eusepi, Andrea Tambalotti, and Giorgio Topa, “Subjective Intertemporal Substitution,” Federal Reserve Bank of New York staff report 734 (March 2019). (Revised from original version of July 2015).

D’Acunto, Francesco, Daniel Hoang, Maritta Paloviita, and Michael Weber, “IQ, Expectations, and Choice,” Bank of Finland research discussion paper 2/2019 (2019).

D’Acunto, Francesco, Daniel Hoang, and Michael Weber, “The Effect of Unconventional Fiscal Policy on Consumer Expenditure,” NBER working paper 22563 (August 2016).

Del Negro, Marco, Domenico Giannone, Marc P. Giannini, and Andrea Tambalotti, “Global Trends in Interest Rates,” Journal of International Economics 118 (2018), 248–262. 10.1016/j.jinteco.2019.01.010

Dräger, Lena, and Giang Nghiem, “Are Consumers’ Spending Decisions in Line with a Euler Equation?” this REVIEW 103:3 (2021), 580–596.

Duca-Radu, Ioana, Geoff Kenny, and Andreas Reuter, “Inflation Expectations, Consumption and the Lower Bound: Micro Evidence from a Large Multi-Country Survey,” Journal of Monetary Economics 118 (2021), 120–134. 10.1016/j.jmoneco.2020.03.005

Duflò, Esther, Douglas Gale, Jeffrey Liebman, Peter Orszag, and Emmanuel Saez, “Saving Incentives for Low- and Middle-Income Families: Evidence from a Field Experiment with H&R Block,” Quarterly Journal of Economics 121:4 (2006), 1311–1346. 10.1162/qjec.2014.111113

Fisher, Irving, “The Debt-Deflation Theory of Great Depressions,” Econometrica 1:4 (1933), 337–357. 10.2307/1907327

Gelman, Michael, Yuriy Gorodnichenko, Shachar Kariv, Dmitri Kostus, Matthew D. Shapiro, Dan Silverman, and Steven Tadelis, “The Response of Consumer Spending to Changes in Gasoline Prices,” NBER working paper 22969 (November 2017).

Hogen, Yoshihiko, and Ryuichi Okuma, “The Anchoring of Inflation Expectations in Japan: A Learning-Approach Perspective,” Bank of Japan working paper series 18-E-8 (April 2018).

Holston, Kathryn, Thomas Laubach, and John C. Williams, “Measuring the Natural Rate of Interest: International Trends and Determinants,” Journal of International Economics 108 (Suppl. 1) (2016), S39–S75.

Ichii, Hikiki, and Shusaku Nishiguchi, “Inflation Expectations and Consumer Spending at the Zero Bound: Micro Evidence,” Economic Inquiry 53:2 (2015), 1086–1107. 10.1111/eiic.12176

Kamdar, Rupal, “The Inattentive Consumer: Sentiment and Expectations,” unpublished manuscript (2019), https://rupalkamdar.github.io/pdfs/inattentive_consumer.pdf.

Kiley, Michael T., and John M. Roberts, “Monetary Policy in a Low Interest Rate World,” Brookings Papers on Economic Activity (Spring 2017), 317–396.

Krugman, Paul, “Not Enough Inflation,” New York Times, May 2, 2013.

Mackowiak, Bartosz, and Mirko Wiederholt, “Dispersed Inflation Expectations and the Zero Lower Bound,” Society for Economic Dynamics meeting papers 1071 (2012).

Mundlak, Yair, “On the Pooling of Time Series and Cross Section Data,” Econometrica 46 (1978), 69–85. 10.2307/1913646

Mundlak, Yair, “On the Pooling of Time Series and Cross Section Data,” Econometrica 46 (1978), 69–85. 10.2307/1913646

Romer, Christina D., “Dear Ben: It’s Time for Your Volcker Moment,” New York Times, October 29, 2011.

Rondinelli, Concetta, and Roberta Zizza, “Spend Today or Spend Tomorrow? The Role of Inflation Expectations in Consumer Behaviour,” Bank of Italy Temi di Discussione working paper 1276 (April 2020).

Shiller, Robert J., “Why Do People Dislike Inflation?” NBER working paper 5539 (April 1996).

Van Zandwaghe, Willem, and John C. Braxton, “Has Durable Goods Spending Become Less Sensitive to Interest Rates?” Federal Reserve Bank of Kansas City Economic Review (fourth quarter 2013).

Volcker, Paul A., “A Little Inflation Can Be a Dangerous Thing,” New York Times, September 18, 2011, http://www.nytimes.com/2011/09/19/opinion/a-little-inflation-can-be-a-dangerous-thing.html.

Wooldridge, Jeffrey M., Econometric Analysis of Cross Section and Panel Data, 2nd ed. (Cambridge, MA: MIT Press, 2010).

Zeger, Scott L., Kung-Yee Liang, and Paul S. Albert, “Models for Longitudinal Data: A Generalized Estimating Equation Approach,” Biometrics 44 (1988), 1049–1060. 10.2307/2531734