Firm Uncertainty and Household Spending*

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Abstract

By mapping households to US employers traded in the stock market and using daily spending data, we provide novel evidence of household spending response to employer-specific forward-looking volatility shocks. A 10 percent change in firm uncertainty leads households to change their average monthly spending over the next 6-months by -0.95 percent. This negative second-moment firm uncertainty effect is larger than the positive first-moment effect of firm stock returns. The employer-specific effect is robust to both industry- and aggregate-level volatility effects. The intensity of the response increases in the forecast horizon window, lasting nine months. The response is pronounced for low-liquidity households, and for households that work at firms that recently had low employee growth, high CAPM β, and low Tobin's Q. Lastly, household spending shows an asymmetric response to 'good' and 'bad' uncertainty.

JEL classification: D10, D80, E03, E21, E32, E44, G02, G30
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1 Introduction

There is an increasing body of literature addressing the question of whether fluctuations in uncertainty affect economic behavior - Bloom (2014) provides a thorough discussion. Uncertainty is a key component of precautionary savings models of consumption of Deaton (1991), Carroll (1997), and Gourinchas and Parker (2002), and is a key driver of aggregate asset pricing models, such as Bansal and Yaron (2004), who model income uncertainty in a long-run risk framework. Despite the surge in interest in uncertainty after the Great Recession and the increased availability of data to proxy for uncertainty, micro-level evidence of household-level response to uncertainty remains largely undocumented.[1] This paper aims at closing this gap by using high-frequency banking and credit and debit card transaction data for thousands of anonymized US individuals.[2]

By mapping household administrative financial data to employers publicly listed in the US stock market (with Compustat, CRSP, and OptionMetrics data), we create a employee-employer panel data to examine the micro-level response of households to forward-looking employer-specific volatility shocks. To the best of our knowledge, our paper is the first to not only test whether households respond to uncertainty shocks originating at the level of their publicly-traded employers, but to also provide elasticities of spending to those shocks. Moreover, the large cross-section of publicly listed employers in our sample (760+ unique firms) allows us to classify households by recent-year firm characteristics (e.g., employee growth, Tobin's Q, CAPM β), and determine whether firm characteristics further matter in the response of households to uncertainty. Our findings show that not only are households responsive to the fluctuations in uncertainty faced by their employers, but the response is also influenced by the fundamental characteristics of their employers relative to other firms.

Recent rare events such as the Great Recession of 2008-09 and the COVID-19 pandemic

[1] primarily because of lack data at the micro-level of households needed to measure spending and income at high frequencies

[2] spending data includes card transactions from daily purchases, such as at a Starbucks store, or online at Amazon.com, and also recurring payments and outflows directly from bank accounts. This type of data has recently been made more widely available due to the development of fintech and big data.

of 2020 are associated with substantial increases in uncertainty for both firms and consumers. Rare disasters like World War I and II and the Great Depression can have significant effects on asset prices, Barro (2006). Such rare events in the US have unfolded with historical spikes in job losses and unemployment rates, and large movements in asset prices. As noted by Fed Chairman Jeromy Powell on May 21 2020 "We are now experiencing a whole new level of uncertainty, as questions only the virus can answer complicate the outlook". Indeed, uncertain outlooks about the economy can raise fear of job losses, concerns about increased irregular work schedules, doubts about receiving performance bonuses and/or option payments. Our evidence indicates that through labor market risk concerns households: a) are attentive to the uncertainty faced by their public employers (e.g., it is a state variable in their economic environment), b) adjust their spending behavior accordingly, which is consistent with a precautionary savings motive of risk averse individuals.

Our motivation for linking employees to employers and examining the household response to firm-specific uncertainty shocks builds on the classical result of traditional models of investment under uncertainty with capital adjustment costs, Dixit and Pindyck (1994), Abel and Eberly (1996), Bloom (2009), Gilchrist, Sim, and Zakrajsek (2014), Bloom, Floetotto, Jaimovich, Saporta-Eksten, and Terry (2018). In these models firms find it optimal to cut down on real decisions of investment and employment due to an increased option value of delaying such decisions in response to heightened uncertainty. Alfaro, Bloom, and Lin (2017) use idiosyncratic forward-looking option-implied volatility to proxy for firm uncertainty and find 1 year-ahead effects on firm employment, investment, and other financial outcomes that are amplified in the presence of financial frictions. We complement this literature by using forward-looking firm-level volatility in the natural next step, exploring the response of employee-level behavior to firm-level uncertainty shocks. [3]

Moreover, as uncertainty about outside opportunities, irregular work schedules, fears

[3]we rely on household administrative data used in some of our prior work Baugh, Ben-David, and Park (2018) and Baugh, Ben-David, Park, and Parker (2020), which is similar to data used in Agarwal and Qian (2014), Baker (2018), and others

of job losses, etc., can correlate across firms in the same industry, we also examine the sensitivity of household spending to industry-level measures of uncertainty. We show that households are also sensitive to forward-looking uncertainty measured at the industry-level of their employers. This indicates that, for example, employees working at Microsoft in the technology industry also pay attention to the uncertainty faced by their employers' peer firms such as Google, Apple, Facebook, etc.

However, when we include employer-specific and industry-level uncertainty measures in the same regressions, we find that the response of household spending to industry-level uncertainty is subsumed by the employer-specific shocks. These results suggest that the idiosyncratic link between households and their employers through the channel of labor income risk is strong, above and beyond the information households might gather at the industry level. Moreover, the employer-specific effect of uncertainty is robust to aggregate uncertainty effects as measured by the VIX (i.e., a measure of aggregate forward-looking volatility implied by S&P 500 index options). Furthermore, we perform placebo falsification tests where we randomly map households to false placebo firms also listed in the stock market, and find no response of household consumption to placebo employer uncertainty. Collectively, these tests provide comforting validation that our findings throughout the paper arise from the unique and idiosyncratic link between households and their employers' uncertainty shocks, a finding novel to this paper. Our results suggest that firm-level uncertainty may have stronger effects on the economy than is so far understood.

Our main findings can be summarized as follows. First, household consumption responds negatively to employer uncertainty shocks. A 10 percent change in firm uncertainty leads households to change their average monthly spending over the next 6-months by -0.95 percent. This result is robust to controlling for the positive offseting effect of firms' stock return - a first moment control to disentangle from the second moment effects of uncertainty. A 10 percent change in the employer's (cum-dividend) stock price leads households to increase their average monthly spending by 0.17 percent. In comparable terms in standard deviation

units, the elasticity of consumption with respect to firm volatility is more than twice as large as the elasticity of consumption to firm stock price.

Moreover, we further show that the firm uncertainty effect is robust to controlling for income shocks that directly affect the budget constraint of households at time of spending. The effect of employer-level uncertainty shocks on future household spending is roughly 1/5 of the size of the effect of a comparable income shock, and therefore economically meaningful (see Figure 3). These results are robust to different measures of uncertainty (e.g., option-implied vs realized) and a battery of different regression specifications (e.g., multiple dimensions of fixed effects and clustering of standard errors).

Second, we find that the uncertainty response of consumption is robust to different windows used in measuring and forecasting household spending. In particular, the effect of firm uncertainty grows in economic magnitude from short horizons of month-on-month changes, peaks at 6 months, and lasts 9 months. These findings suggest that in adjusting spending, households do not show a strong and immediate month-on-month response to an uncertainty shock observed in the preceding month, rather the adjustment takes at least 3 months, and extends up to 9 months.

Third, we document a strong asymmetric response of household spending to 'good' and 'bad' firm uncertainty shocks. In particular, we find some evidence that household spending responds positively to 'good' uncertainty shocks (defined as decreases in uncertainty), yet very strong evidence of a negative and more intensive response to 'bad' uncertainty shocks (increases in uncertainty). These results are consistent and provide micro-level support for the aggregate-level evidence of the effects of good and bad uncertainty on the economy Segal, Shaliastovich, and Yaron (2015).

Fourth, exploiting the rich details of the data to classify daily spending transactions into consumption categories, we find that spending at retail stores exhibits a stronger negative response to uncertainty shocks relative to spending on groceries and restaurants. We find no evidence of a sensitivity of grocery spending to uncertainty. Moreover, spending on durable

goods (e.g., purchases at automotive-related stores, home items, home improvements, and home maintenance) has the largest response to uncertainty shocks across spending categories. These results indicate that households engage on both the intensive and extensive margins on the types of goods and services adjusted in response to increased uncertainty - with discretionary spending being the most sensitive.

Fifth, splitting households into terciles by liquidity levels (as measured by time-varying bank account balances) shows a monotonically decreasing sensitivity of spending across liquidity groups. Relative to middle- and high-liquidity, low-liquidity households cut spending the most in response to uncertainty shocks. Intuitively, households with low liquidity levels lack precautionary savings, and in the presence of increased income uncertainty they have the most incentive to decrease spending to smooth consumption going forward. Moreover, splitting households by income-levels, we find that low- and middle-income households respond to uncertainty shocks whereas high-income do not. We find similar results when classifying households by within-firm employee seniority levels. These results are indicative that high-ranking employees and high-income individuals likely have other means of buffering potential negative shocks to their income and consumption streams. For example, they may be able count on additional non-labor related income for rainy days - such as from stock market participation-, and therefore can better diversify labor risk.

Lastly, classifying households by fundamental characteristics of their employers, we find that the intensity to uncertainty shocks is highly pronounced amongst households that work for firms with recent low employment growth, low investment opportunities (as proxied by Tobin's Q), and high covariance with the market portfolio return (i.e., risky firms with high CAPM beta). This suggests that fundamental characteristics of firms may contain additional information on both the origins and extent through which income risk passes through from employers to employees.

Related Literature. To our knowledge, our paper is the first to examine the response of household behavior to employer-specific uncertainty shocks. Our setting merges rich

household administrative data to measure spending, income, checking and savings bank account balances, etc., with forward-looking volatility as a measure of firm uncertainty of listed firms.[4] As stressed earlier, our motivation for linking employees to employers and examining the household response to firm-specific uncertainty shocks builds on the classical result of models of stochastic volatility shocks (Dixit and Pindyck (1994), Abel and Eberly (1996), Bloom (2009), Gilchrist et al. (2014), Bloom et al. (2018), Alfaro et al. (2017))[5], in which increased uncertainty induces firms to delay investment and employment decisions due to an increased option value of taking a wait-and-see position towards investment. We exploit the findings in Alfaro et al. (2017) who document that forward-looking idiosyncratic shocks to the volatility of US firms induce them to reduce employment, investment, and other firm-level outcomes - specially in the presence of financial frictions. We complement this literature by using forward-looking firm-level volatility in the natural next step, exploring the response of employee-level behavior to firm-level uncertainty shocks. Through the lens of labor income risk, our findings suggest that not only is employer-specific uncertainty an important economic state variable for employee behavior, but that the effects passed through onto household spending are economically sizable, yet not 1-to-1. We show that liquidity levels of households offer some degree of self-insurance through precautionary savings.

In addition to the macro uncertainty literature, our paper is also related to the literature on the effects of income risk. Fagereng, Guiso, and Pistaferri (2017), use Norwegian population data to match employees to employers and test a precautionary savings motive in consumption. They employ firm performance volatility to capture exogenous variation income risk. However, their analysis is restricted to private non-traded firms (e.g., relatively

[4]this measure is very likely exogenous to households, and helps overcome concerns about endogoneity fairly typical in household studies. Option-implied volatility data is available almost in real-time or with modest delays measured in days or weeks

[5]see also Bertola and Caballero (1990) Davis and Haltiwanger (1992) Caballero, Engel, and Haltiwanger (1995) Cooper and Haltiwanger (2006), and the classic papers on uncertainty and growth Bernanke (1983), Romer (1990), Ramey and Ramey (1995), Leahy and Whited (1996), Guiso and Parigi (1999), Bloom (2009), Bachmann and Bayer (2013), Fernandez-Villaverde, Quintana, Rubio-Ramirez, and Uribe (2011), Fernandez-Villaverde, Guerron-Quintana, Kuester, and Rubio-Ramirez (2015), and Christiano, Motto, and Rostagno (2014), etc.,

small firms in Norway). Moreover, in contrast to our high-frequency transaction data that allows us to measure and classify spending by categories, Fagereng et al. (2017) do not observe consumption directly but rather infer it from the annual-frequency budget constraint of households (so called "imputed" consumption). Baker, Kueng, Meyer, and Pagel (2018) argue, that although of minor effects, discrepancies between imputed and actual spending between two annual snapshots can occur in the data. Our consumption data is not imputed, rather is as observed and reported in the books of financial institutions. Fagereng, Guiso, and Pistaferri (2018) use employee-employer matched data to look at the effects of income risk on portfolio choices. Moreover, in earlier work Fuchs-Schündeln and Schündeln (2005) and Kantor and Fishback (1996) examine a precautionary savings motive using natural experiments. Our work is granular in measuring spending and exploits the link of employees to employers and the information contained in the stock market.

Another approach to understanding the effect of uncertainty on household behavior is to rely on uncertainty measures obtained from surveyed subjective expectations about economic outlooks (Dominitz and Manski (1997), Guiso, Jappelli, and Pistaferri (2002), Jappelli and Pistaferri (2000)). Most recently Ben-David, Elyas, Kuhnen, and Li (2018) using household-level survey data find that households with more uncertain expectations about the economy indicate their *intention* to reduce consumption going forward, which is consistent with our results. However, relative to these studies we connect households to firms and instead of relying on lower frequency surveys to measure uncertainty we use high-frequency market-driven uncertainty shocks. Similarly, our spending data is observed behavior as recorded in millions of daily spending transactions, which in turn further allows us to estimate elasticities of spending at different high-frequencies and by categories (e.g., retail, restaurant, groceries).

Because we control for realized income shocks, our paper is also related to the literature on the consumption response to realized income shocks. [6] A closely related paper in this

[6]See Bodkin (1959), Zeldes (1989), Parker (1999), Souleles (1999), Pistaferri (2001), Hsieh (2003), Johnson, Parker, and Souleles (2006), Blundell, Pistaferri, and Preston (2006), Agarwal, Liu, and Souleles (2007), Aaronson, Agarwal, and French (2012), Agarwal and Qian (2014), Kueng (2018), and Ganong and Noel (2019), among others.

field using similar financial administrative data to examine consumer spending is Baker (2018). In a similar setting linking employers listed in the stock market to employees, the paper examines the effect of household realized income shocks on spending. We differ in that we control for realized income shocks (a first moment effect) and focus on forward-looking uncertainty of labor income shocks as captured by the employers' volatility shocks (a second moment effect). Similarly, Ganong, Jones, Noel, Farrell, Greig, and Wheat (2020) link households with employers using administrative data, and as in Baker (2018) analyze the consumption response to realized income shocks - yet further provide insights into racial inequality through the lens of household liquidity. Ganong et al. (2020) is silent about the role of forward-looking uncertainty shocks, therefore is complementary to our paper.

Another related paper is Agarwal, Charoenwong, and Ghosh (2019a), who look at stock market performance in India and household consumption. They find that wealthy and more liquid households chase investment returns by foregoing consumption. We overlap in showing evidence of household consumption response to both total market return and aggregate volatility (in our case the US stock market). However, our paper emphasizes the link between household consumption and employer-specific volatility shocks. Moreover, Knotek and Kahn (2011) and Fulford (2015) find that uncertainty does not have an important role in influencing household consumption. Our paper differs from these papers in that we are testing the consumption response at the household level instead of at the aggregate level, as is in Knotek and Kahn (2011), and that we are able to track the consumption response to firm uncertainty shocks using administrative data instead of survey data as is in Fulford (2015). Moreover, Agarwal, Aslan, Huang, and Ren (2019b) find that households reduce their stock market participation after shocks to political uncertainty. We differ in that our uncertainty measure is not aggregate and that we explore consumption responses and not stock market participation.

Lastly, in a paper subsequent to ours, using credit report data Di Maggio, Kermani, Ramcharan, Yao, and Yu (2020) link employers to employees, and report drops in employee

wages and variable pay following increases in firm realized volatility. Moreover, they examine the effects of firm volatility on the purchase of durable goods, by looking at the likelihood of employees making car purchases and becoming first-time homeowners (as indicated by the credit reports). Their evidence on very large purchases nicely complements our work on spending, though due to the differences in the data, we are able to exploit day-by-day spending transactions to provide novel elasticities of spending to firm volatility shocks, including non-durable goods and services. Further, by observing consumer spending behavior at high frequencies we are also able to examine how suddenly or gradually and how far into the future households adjust their typical spending behavior in the face of fluctuations in uncertainty, which is in contrast to the responses households can have when making larger yet very infrequent purchases - such as a home or a car. Moreover, we find stronger effects of firm uncertainty when measured using forward-looking option-implied volatility. Finally, our detailed data also includes linked bank accounts that allows us to measure bank account balances and further study the effects of forward-looking uncertainty on spending in the presence of household liquidity constraints.

The paper proceeds as follows. Section 2 presents the data and empirical methodology, section 3 the results, and section 4 concludes.

2 Data and Empirical Methodology

The household banking and credit card transaction data comes from an online account aggregator. This online service helps households manage their budgeting, bill payments, savings, and investments in a convenient fashion. Households provide their login information of the various banks and credit card services that they are using to the website, and in turn, the website retrieves the information from each financial institution for the household. The data used in this paper is the same as Baugh et al. (2018) and Baugh et al. (2020). Recent papers that use similar administrative data include Agarwal and Qian (2014), Baker (2018),

Olafsson and Pagel (2018), Aydin (2019), Ganong and Noel (2019), and Olafsson and Pagel (2019). Baker (2018) provides an extensive overview of the characteristics of this type of data.

The data contains the details of daily transactions for approximately 2.7 million households from June 2010 to May 2015. It includes all checking, savings, debit card, and credit card transactions for any bank account once linked to the service by the household. We observe permanent household identifiers, and for each transaction, the date, the amount, whether the transaction was an inflow or outflow, transaction categories as provided by the data providers, and the transaction description. It is similar to looking at a bank or credit card statement. Given the data also includes bank transactions we also observe income flows into the households' bank account from payroll deposits by employers.

For many of these income transactions, we can identify the names of the employers, which allows us to link the household to both private and public firms. This study focuses on the link between households and their publicly-traded employers. For these employers we exploit forward-looking option-implied volatility measures to proxy for firm uncertainty. We use a fuzzy matching algorithm to match the employer names of the household data to the company names on Compustat. Figure 1 shows the number of unique households in the data that are matched to unique Compustat firms throughout the sample period. In total, we can identify 92,259 households that we can link to Compustat firms. The universe of Compustat firms is larger than that of firms in CRSP and OptionMetrics, from which we require stock returns and option-implied volatility measures, respectively. We drop households with limited transaction data to measure spending, income, and bank account balances.

To appear in the regression analysis that uses monthly household and firm observations we require households be linked to their employers, through observed monthly payroll deposits, in the preceding 18-month window. Firms must also have both volatiltiy and return data during the link window. We drop households that report an average monthly income below

$500 (e.g., a minimum threshold for someone working less than 4 hours a day at minimum US hourly wages). Results are robust to not imposing this income filter. After dropping households with limited daily transaction information and after merging to employers (having Compustat, CRSP, and Optionmetrics data), we are left with an employee-employer panel with 49,294 unique households linked to firms with OptionMetrics data to proxy for forward-looking firm volatility (51,638 households when measuring volatility using realized CRSP return data) and 763 unique publicly listed firms with Optionmetrics data (939 with CRSP data). This mapping comprises the sample used in our regression analysis after all filters imposed both on household, firms, and their link. The reason for the drop in the number of matched households relative to the 2.7 million unmatched households is that for many households the income description only contains the word "payroll" or "direct deposit" and does not have any information on the employer. Other households work for private firms, non-profits, or the government, which we cannot link to Compustat. Finally some households do not link their income-receiving bank account to the online account aggregator service. We restrict our sample to households that report transactions within the US, therefore our sample comprises US households.

Figure 2 shows the distribution of income for the matched households in the sample and the distribution of income for the latest US Census in 2011. As shown, households in our sample vary widely in income levels that span the Census distribution. However, the correspondence is not perfect as is to be expected as the income that we observe is net of taxes and benefits such as 401k contributions, health care premiums, etc. and that we require households be employed by publicly-traded firms. Nonetheless, the income distribution of sampled households shows reasonable similarities with respect to the US population, which likely reduces concerns as to the external validity of our findings. In the Appendix Figure A.1 we show the distribution of sample firms by number of employees, market equity, Tobin's Q, book-to-market equity ratios, Capital Asset Pricing Model (CAPM) β, and investment rates. Among other shown characteristics, sample firms range from small to large size, growth to

value firms (as seen by the distribution of book-to-market equity ratios), and low to high risk firms (according to β).

Table 1 shows summary statistics of variables used in the regression analysis. In measuring household spending from the daily transactions reported using credit and debit card transactions and from recurring payments and outflows from the bank accounts, the most direct approach is to use the data provider's categorization of transactions. We construct a measure of consumption that consists only of outflows that we are highly confident represent typical spending on consumption at retail, groceries, and restaurants. Using the linked accounts, we define spending as the sum of transactions classified by the data provider in the following categories: automotive, child expenses, clothing, entertainment, gas, gifts, groceries, healthcare, home maintenance, cable, online services, personal care, restaurants, travel, hobbies, telephone/mobile, pets, electronics, general merchandise, and office supplies.

However, as with similar administrative data, the provider's classification is not always perfect, where for example a purchase at a clothing store may not have been classified correctly in the clothing category, instead assigned into an 'uncategorized' category. Therefore, we augment the data provider's classification in measuring spending by using keyword searches to identify additional purchases at retailers, restaurants, and grocery stores. In identifying these consumption transactions, we use a number of lists that include the names of retailers and grocery stores spread across the US (both major and less-well known), for example we include the top 100 retailers during the sample period.[7] For restaurants, we also use an equivalent list for the top 100 restaurants.[8] Moreover, for completeness, we further augment this list by searching for relevant keywords such as burger, taco, pizza, grill, steak, etc., to capture transaction at restaurants that may have been miscategorized by the data provider. Moreover, in measuring spending we do not include transfers, cash withdrawals, or credit card payments. Lastly, we are unable to categorize outflows made by check, thus our consumption measure understates actual consumption spending.

[7] https://web.archive.org/web/20130116172041/http://www.stores.org/2012/Top-100-Retailers
[8] http://nrn.com/us-top-100/top-100-chains-us-sales

In measuring monthly spending from the daily credit and debit card transactions, we aggregate the dollar spending to the monthly level for each user. As in Baker (2018) usage patters point to the conclusion that linked financial accounts cover the entirety of the household, as such the users in our data can be thought of as head of households. After aggregating daily transactions to monthly consumption as identified by the linked accounts, we take into consideration consumption in unlinked credit cards for which we only observe payments to unlinked cards, not spending on these credit cards. Our approach is that instead of measuring spending just using the accounts linked to the aggregator service, or simply imposing a minimum number of linked financial accounts (e.g., Baker (2018) requires a minimum of 3 linked accounts), we follow Baugh et al. (2020) and scale up observed spending from the linked credit cards by the household-specific monthly ratio of payments to all cards (linked and unlinked) divided by the payments to linked credit cards. That is, we infer spending for the unlinked credit cards by using the spending patters for the linked accounts we do observe in fine detail, including by spending subcategories. We find similar results if we require households have at least 3 linked accounts as in Baker (2018) or don't scale up consumption altogether - this in part because as is common in the literature we examine changes in spending, and not the levels per se, and thus the scaling up factor inferred from detailed observed patterns in spending plays less of a role. Table 1 reports that the average monthly spending for the households in our sample is $3,027.

Our baseline measure of uncertainty uses the option-implied volatility of firms from OptionMetrics. In particular, our measure of implied volatility of firms follows Alfaro et al. (2017) and is measured as the 252-trading-day average of daily implied volatility values from at-the-money 365-day forward call options, from OptionMetrics. Moreover, we also measure uncertainty using realized stock return volatility from CRSP, where realized volatility is the annualized standard deviation of daily CRSP cum-dividend stock returns within a 365-day window.[9] As shown below, we document robust results to either measure, but stronger us-

[9]to annualize we multiply the realized volatility by the square root of 252 (average number of trading days in a year)

ing implied volatility. We find similar results when using option-implied volatilities from at-the-money 91-day forward call options.

In our regressions, most variables are measured in terms of growth rates. For the growth, we follow Davis and Haltiwanger (1992), where for any variable x_t, the growth is calculated as $\Delta x_t = (x_t - x_{t-1})/(\frac{1}{2}x_t + \frac{1}{2}x_{t-1})$. This growth measure has the nice statistical feature of being symmetric about zero and bounded between -2 and 2 for positive values of x (such as firm volatility and US$ Dollar consumption and income values), and thus is less prone to extreme outliers than log changes. Moreover, as indicated by Davis, Haltiwanger, Jarmin, and Mirand (2007) it also lends itself to consistent aggregation, and is identical to log changes up to a second-order Taylor Series expansion, yet offers advantages over log-changes. In untabulated results, we redid the entire analysis presented in this paper using log changes to measure growth rates and find, in general, a stronger response of spending growth to uncertainty shocks. Lastly, the variable that does not use the growth measure of Davis and Haltiwanger (1992) is the cum-dividend CRSP stock return (implicitly the change in firm stock price that includes dividend per-share payouts). Table 1 shows summary statistics for all the main variables in our regression sample. All regression variables are winsorized at the 1 and 99 percentiles every month.

Our main regression specifications test whether an increase in the option-implied uncertainty of the firm for which a household works for is associated with future downward adjustments in household consumption. Given that households may take some time in gradually adjusting their monthly spending after rises in uncertainty, our baseline outcome variable for consumption growth is the change in average monthly spending from a 6-month period to the next 6-months (explained below). However, we show that the results are also present when we either decrease or increase the window length in measuring changes in average monthly spending. Therefore, our baseline regression specification is as follows:

$$\begin{aligned}\Delta\text{Consumption}_{i,t} = \beta_0 + \beta_1 \cdot \Delta\text{Volatility}_{j,i,t-6} + \beta_2 \cdot \text{6M Return}_{j,i,t-6} + \beta_3 \cdot \Delta\text{Income}_{i,t} \\ + \beta_4 \cdot \ln(\text{Zillow Home Price Index})_{c,i,t} + \alpha_i + \gamma_j + \delta_t + \epsilon_{i,t}\end{aligned} \tag{1}$$

This regression examines the forecasting effect of firm (employer) uncertainty shocks on future household (employee) consumption growth. The frequency of all variables is monthly. $\Delta\text{Consumption}_{i,t}$ is the 6-month growth in average monthly consumption at retail, restaurant, and groceries at the household i level. For each household, we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into the next 6-months. Our main uncertainty variable, referred to as uncertainty shocks, $\Delta\text{Volatility}_{j,i,t-6}$ is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome.

Moreover, to disentangle between the predictive effect of second moment uncertainty shocks from first moment effects, we control for the lagged stock return of the employer, $\text{6M Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different places across the U.S, all specifications include as control a monthly home price index (in log) from Zillow measured at the county level c for each household i. [10] α_i, γ_j, δ_t are household, employer, and time fixed effects, respectively. Standard errors are clustered at the employer level. However, in Appendix Table A.1 we show robustness to clustering errors in multiple dimensions, including at the industry level and time (month-year).

[10] Our results are robust to using a cost-of-living index following Baugh et al. (2018) that uses average Dollar spending at the nearest city to control for differences in local economic conditions

3 Results

3.1 Uncertainty and Consumption

Table 2 presents the main results that run specification 1. The use of growth rates in both the LHS spending growth and the RHS income growth means that the coefficient on income growth, β_3 , can be interpreted as an elasticity of consumption with respect to income as in Blundell et al. (2006) and Baker (2018) [11] Similarly, the coefficients on firm volatility growth, β_1, and stock returns (implicitly a change in price including dividends), β_2, can be interpreted as elasticities of consumption with respect to employer volatility and stock price, respectively.

Column (1) in Table 2 reports a highly significant point estimate on the employer volatility shock of -0.108, which means that a 10 percent change in firm uncertainty is associated with a change of -1.08 percent in average household monthly spending in the subsequent 6-months. Given that firm uncertainty is measured using option-implied volatility data, largely an exogenous variable for households, the uncertainty effects are likely causal. Column (2) adds the firms' stock return as control variable to disentangle between second moment firm uncertainty and first moment effects. The household consumption response to uncertainty shocks remains negative and similar in magnitude (-0.098 coefficient). The point estimate on the employer stock return is 0.017 and means that a 10 percent change in firm cum-dividend price leads households to increase their average monthly spending by 0.17 percent. The positive direction of the response to the stock return of the firm is likely indicating that households have less concerns about future layoffs and rather anticipate positive income flows, e.g., higher likelihood of receiving bonus for performance or option-based compensation.

What is perhaps somewhat surprising is that the second moment effect of uncertainty

[11] both papers use log changes to measure the growth in consumption and in income to estimate elasticities. As stressed earlier, our growth measure follows Davis and Haltiwanger (1992) and Davis et al. (2007) due to its advantages over log changes, yet the measure is identical to log changes up to a second-order Taylor Series expansion. In untabulated results, we repeated the analysis presented in this paper using log changes and, in general, found stronger response of spending growth to uncertainty shocks

on consumption is more than twice as large as the first moment effect of stock returns. Column (4) presents that standardized coefficients that allow comparison across regressors in terms of a standard deviation increase in the RHS variables. The results suggest that households are, indeed, risk-averse and not only do they care about uncertainty to their income-streams going forward but also that they pay more attention to this second moment variable than the signals received alone from stock returns. Column (4) indicates that a standard deviation increase in firm volatilty leads households to reduce their future average monthly consumption by 0.89 percent, while only increasing it by roughly half as much by 0.44 percent in response to a 1 standard deviation increase in the stock price of the employer.

In columns (3) and (4) we present our main results that run the regression specified in equation 1 with controls, in particular we further control for current income changes. Column (3) reports a coefficient on the income shock of 0.128, which means that a 10 percent increase in income is associated with a 1.28 percent change household spending. This elasticity is in the (lower) ball park of recent work that has focused on estimating the income elasticity of consumption using similar administrative financial data for US households, e.g., Baker (2018) and Ganong et al. (2020). These studies, however, are silent with respect to firm uncertainty as associated with labor income risk, for which we find strong negative effects after accounting for realized income shocks.

In all, Table 2 shows that the effect of uncertainty on household consumption is significant and economically meaningful in size. In particular, the uncertainty effect is larger than the first moment effect of the firm's stock returns and is about 1/5 of the effect of an actual income shock that directly affects the budget constraint of households - see column (4) for the standardized coefficients and Figure 3 for the comparison of the effects. Moreover, our results indicate that an increase in uncertainty combined with a decrease in returns (e.g., a double negative shock as in the 2008-09 financial crisis) jointly combine to negatively affect household consumption. Lastly, in columns (5) to (8) in Table 2 we document robust effects (yet smaller in size) when measuring firm uncertainty shocks using realized employer

stock return volatility from CRSP instead of forward-looking option-implied volatility from OptionMetrics.

In Table A.1 in the Appendix, we implement a battery of robustness tests to see if our results hold under different specifications. The left panel uses option-implied volatility from OptionMetrics, while the right panel uses realized volatility from CRSP. Column (1) in Table A.1 replicates the baseline regression with the full set of controls in column (3) of Table 3. In column (2), we cluster the standard errors by time and by firm (separately) and find robust results. In column (3), we use industry fixed effects instead of firm fixed effects, while in column (4) we cluster standard errors by household and time instead of by firm and time, and in column (5) we cluster standard errors by industry (3-digit Standard Industry Classification codes) and time. In all, we find that the effect of employer-specific uncertainty remains large and significant across the specifications presented in Appendix Table A.1.

However, one concern could be whether it matters if we measure firm uncertainty in levels rather than in shocks, while another may be whether it matters to measure uncertainty in lags rather than concurrently to consumption growth. We address both questions in Table A.2 in the Appendix, where column (1) presents the baseline results in column (3) of Table 3 using option-implied uncertainty shocks. Columns (2) to (4) change either the functional form of uncertainty or its timing, or both. If anything, we find that measuring uncertainty in levels and contemporaneously to the LHS consumption growth outcome, column (4), yields even stronger effects than our preferred specification in Table 3. Therefore, our baseline results presented throughout the paper are relatively conservative.

3.2 Uncertainty and consumption growth at different forecast horizons

The baseline results presented to this point forecasts changes in average monthly household spending using 6-month windows (equation 1). This section explores whether the precautionary savings motive effects of uncertainty extend to longer horizons and whether

they kick-in at very short horizons, such as month-on-month changes in spending. Figure 3 presents results for various different forecast horizons and windows over which spending, firm uncertainty, and controls are measured.

Panel A in Figure 3 shows the percent change (y-axis) in future average household monthly spending in response to employer uncertainty shocks (in blue) and stock returns (in red). The results for the baseline 6-month forecasts presented in column (4) (standardized coefficients) in Table 2 are plotted where the x-axis equals τ=6 months. To ease comparison of effects across variables and across the different forecasted windows, the effects shown are from the standardized regressors for volatility shocks, returns, and controls. In all other horizons (τ=1,3,9,12 months) spending, firm variables, and controls are measured using the window specified on the x-axis, i.e., adjusting the timing of variables in equation 1. For instance, at the horizon of τ=1 month the plot presents the results from regressing the month-on-month changes in household spending on month-on-month changes in employer volatility (lagged by 1-month), 1 month stock return (also lagged), and the month-on month change in household income (measured concurrently to household spending).

Results in Panel A in Figure 3 indicate that firm uncertainty shocks have trivial effects on month-on-month changes in household spending, meaning that households do not immediately respond to uncertainty shocks observed in the previous month. However, at the 3-month horizon and up to 9-months we see significant negative effects of firm uncertainty on household spending, with a peak at the 6-month horizon. The plot also shows that firm stock returns (a 1st moment effect) have a positive offsetting effect on household spending, yet only significant at the 3- and 6-month horizons. As shown, the magnitude of the 1st moment effect of returns is smaller than that of the negative 2nd moment effect of firm volatility. This can also be seen in Panel B in Figure 3 that shows the magnitude of the effects of both volatility and firm returns as a fraction of the effect of an income shock. For instance, the baseline 6-month results in column (4) in Table 2 indicate that the magnitude of the negative effect of a standard deviation increase in firm volatility growth is roughly 1/5

of the effect of an income shock of size 1 standard deviation.

In short and as shown in Panel B in Figure 3, the 2nd moment effects of firm volatility are stronger than 1st moment effects of firm retuns in all horizons up to 12-months (by a factor of 2 or more), and the negative effects of firm volatility as a fraction of the positive effects of income shocks (as directly observed from income flows in bank accounts) range from about 5% at 1-month to roughly 20% at the peak of 6-months. The comparison of the effects relative to income shocks, indicate that the effect of firm uncertainty through a precautionary savings motive are economically meaningful on household behavior. Indeed, our evidence suggests households are risk averse in the face of uncertainty and respond accordingly by adjusting their spending behavior.

3.3 Industry and aggregate uncertainty

In Tables 3 and 4, we examine if households adjust their consumption in response to industry- and aggregate-wide uncertainty shocks and stock returns. Moreover, we test whether the strong negative effects of employer-specific uncertainty shocks presented to this point remain significant after controlling for industry- and aggregate-level uncertainty shocks and stock returns. Column (1) in Table 3 repeats the results for the baseline regression that shows the effect of employer-specific uncertainty shocks and returns (i.e., baseline column (3) in Table 2 discussed above). In columns (2) and (3) in Table 3 we drop both the firm-specific uncertainty shock and return and replace them with industry-level measures of uncertainty shocks and returns. Specifically, every month we take the cross-sectional weighted average of all firms within the same industry k of the employer j of household i as classified by the Fama-French 49 industry portfolios classification. [12]. Columns (2) to (4) in Table 3 weight firms by their monthly CRSP market value (shares outstanding times share price) in creating the industry-level aggregates. In column (2) we see that household spending responds

[12]This industry-level classification is standard in finance and addresses some concerns about having very thin number of firms when using Standard Industry Classification (SIC) codes at, say, 4 or 3 digits to group firms in industries. However, our results are robust to using 3- and -4 digit SIC codes and the Fama-French 30 industry classification to construct industry-level aggregates for volatility and stock returns

positively to industry-level stock returns, significant at the 10% level, and in column (3) this sensitivity is somewhat smaller when we further add industry-level uncertainty shocks, which is significant at the 5% level. Column (3) reports an industry-level uncertainty elasticity of consumption of -0.203, while also showing an industry-level price elasticity of consumption of 0.0418. These point estimates mean that a 10 percent increase in the employer's industry volatility is associated with a change in consumption of -2.03 percent at the household level, while a 10 percent increase in the industry-level cum-dividend prices leads households to increase consumption by 0.42 percent.

Column (4) in Table 3 runs a horse-race between the firm-specific and industry-level uncertainty shocks and returns. After controlling for the employer-specific effects, we find that the effect of industry uncertainty shocks and industry returns of column (3) is no longer significant. Employer-specific uncertainty shocks and returns remain highly significant with similar points estimates as in column (1), suggesting that the idiosyncratic link between households and employers through a labor-income uncertainty channel is strong above and beyond industry uncertainty effects. In columns (5) and (6) we present results that equally weight all firms when constructing the industry-level measures of uncertainty shocks and returns. In contrast to the value-weighted industry variables in column (2), we find no evidence of a response of household spending to the equally weighted industry aggregates in column (5). This suggests that households pay closer attention to the larger firms in their industries to learn about the overall situation and uncertainty affecting their employers - for example, a worker in the tech industry might not necessarily look at the situation of the dozens if not hundreds of firms in their industry, but rather pay closer attention to the big players such as Google, Apple, Microsoft, etc., to learn about outside job opportunities and overall industry trends in uncertainty and returns. Lastly, the results in columns (2) and (3) in Table 3 also suggest that employees that work for private firms that are not listed in the stock market (outside of our sample), might use information available in the stock market of their employer's industry to inform themselves about similar trends in the uncertainty

confronting their non-listed employers.

Table 4 examines the household consumption response to aggregate measures of uncertainty and returns. In columns (1) through (6), we look at the effects of aggregate uncertainty and stock market returns on household consumption growth. For aggregate uncertainty we use the levels of the VIX (i.e., a measure of volatility implied by S&P 500 index options),[13] and to measure first moment stock market effects we use the 6-month compounded return on the S&P 500 index (columns 4-6), and the 6-month compounded return on the value weighted total market return from CRSP (columns 1-3). To avoid perfect collinearity between these aggregate variables and the month-year fixed effects used prominently throughout the paper we drop the time fixed effects in Table 4 and allow the aggregate variables of uncertainty and market returns to capture the effects arising from common shocks affecting all households at every monthly point in time. In short, Table 4 reports that the VIX as a measure of market-wide uncertainty shows a negative effect on household consumption - columns (2) and (5)- while the stock market returns are positively associated with household spending. Upon running a horse-race between the employer-specific uncertainty and return effects and the market-wide measures for uncertainty and returns (columns (3) and (6) in Table 4), we find a robust response of households to their employer-specific uncertainty shocks above and beyond market-wide effects.

3.4 Good and bad uncertainty

Results to this point document a strong negative and *average* effect of employer-specific uncertainty shocks on household spending. However, one might ask whether the effects of downside and upside uncertainty are symmetric? Segal et al. (2015) decompose aggregate uncertainty into 'good' and 'bad' uncertainty associated with positive and negative innovations to macroeconomic growth, and document that good uncertainty predicts an increase

[13] In measuring aggregate annual uncertainty using the VIX we use a 252-day moving average of VIX daily data. Results are robust to using 6-month changes in the VIX (i.e., VIX shocks) or measuring aggregate volatility from the cross-sectional average of firm-level volatility shocks (either option-implied or realized)

in future economic activity, such as consumption, output, and investment, while bad uncertainty forecasts a decline in economic growth and depresses asset prices. In that spirit, in this section we perform a similar experiment using our rich micro-level data to test whether households respond asymmetrically to good and bad uncertainty measured at the employer level.

In particular, the direction of the growth in employer-specific uncertainty, $\Delta Volatility$, can be naturally separated into 'bad' (ΔVolatility$>$ 0) and 'good' (ΔVolatility$<=$ 0) uncertainty shocks. In Table 5, we examine whether households respond asymmetrically to uncertainty shocks by interacting the absolute value of the employer uncertainty shock, |ΔVolatility|, with an employer indicator that takes value $D^{Bad} = 1$ if the shock is bad, ΔVolatility$>$ 0, and zero otherwise.

For comparison of the size of the effects, columns (1) and (3) in Table 5 show the specification with controls presented in columns (3) and (7) of Table 2 that document a negative *average* effect of option-implied and realized firm volatility shocks, respectively. In columns (2) and (4) in Table 5 the coefficient on |ΔVolatility| is the slope for good uncertainty shocks, while the coefficient on the interaction term |ΔVolatility| $\times$ D^{Bad} is the difference in the slopes for good and bad uncertainty shocks (i.e., a formal test for the alternative hypothesis of an asymmetric response of household spending to bad uncertainty shocks relative to good shocks). The sum of those 2 coefficients is the slope for bad uncertainty shocks (i.e., effect of bad uncertainty on household spending). The less meaningful coefficient on the dummy D^{Bad} simply captures the difference in the effects between good and bad uncertainty shocks at a zero starting value of |ΔVolatility| = 0 (i.e., the difference in the intercept between the slopes of good and bad uncertainty shocks).

We find strong asymmetric sensitivities of households to good and bad uncertainty shocks. Using option-implied volatility in column (2) we find that the slope on good uncertainty shocks is 0.0003 (statistically zero), while the slope on bad uncertainty shocks is -0.2247 (= -0.225 + 0.0003), and the difference between the good and bad uncertainty slopes is highly

significant at -0.225 (at the 1% level). In words, using option-implied volatility to measure uncertainty shocks, we find that household consumption does not respond to good employer uncertainty shocks, yet responds significantly in a negative direction to bad uncertainty shocks, with an elasticity of -0.225, which is more than twice as large as the average elasticity reported to this point and in column (1) in Table 5. Therefore, we find strong asymmetric effects between upside and downside uncertainty on household spending as measured by forward-looking options data.

These results are a bit different if we look at column (4) that uses realized stock return volatility to measure employer uncertainty. Using realized volatility (a backward-looking variable) we find that household consumption responds positively to good uncertainty (slope of 0.0297 significant at the 5%), while much more intensively in magnitude and in the opposite direction to bad uncertainty shocks (with a difference in slopes of -0.103 significant at the 1%). Thus, we also find evidence of strong asymmetric responses of household spending - yet with smaller effects from 'bad' uncertainty - when using realized firm volatility relative forward-looking measures.

In all, Table 5 documents strong asymmetric responses to 'good' and 'bad' uncertainty shocks arising from rich micro-level data of households, which is consistent with the aggregate results in Segal et al. (2015). However, in this paper we emphasize a precautionary savings motive of risk averse households facing labor market concerns, as associated with their employers' uncertainty shocks, as the mechanism at work driving household spending dynamics (e.g., as in workhorse models that focus on income uncertainty such as Bansal and Yaron (2004)).

3.5 Uncertainty and Retail, Restaurant, Grocery, and Durable Consumption

The results so far show that firm uncertainty has a significant effect on household consumption. However, the consumption response might differ in intensity depending on the

characteristics of the purchased goods and services, such as the durability of purchased goods and/or how discretionary or not each acquired good is for the household. For example, when households are facing uncertainty shocks, they may find it preferable to reduce or delay spending for larger ticket items such as home furniture, while they may not have as much discretion on buying groceries. In Figure 4, we look at four broad consumption categories: consumption at retail, restaurant, groceries, and durable goods. While spending at restaurant and grocery stores tend to be non-durable, spending at retailers is more so - yet arguably not entirely clear as goods may include a combination of durable and non-durable goods and services, for examples a pair of shoes or clothing might be considered non-durable at the annual frequency but at shorter horizons, say, at 3 or 6 months it might be considered a durable good. Therefore, we also present results for a narrow classification of durable purchases, which we identify as strictly related to spending at automotive-related stores (e.g., parts, repairs), and home (e.g., home-items, home-improvement, home-maintenance).

In short, Figure 4 shows evidence that retail spending is more sensitive to uncertainty shocks than spending at restaurants and on groceries. We find little evidence of a sensitivity of grocery spending to uncertainty. Moreover, spending on durable goods has the largest response to uncertainty shocks across spending categories. These results indicate that households engage on both the intensive and extensive margins on the types of goods and services adjusted in response to increased uncertainty - with discretionary spending being the most sensitive.

3.6 Intensity of Response Across Household Income and Liquidity levels, and Employee Seniority

So far, we have examined how the average household in our sample responds to uncertainty shocks without taking into account household characteristics. In Table 6 we look at the cross-section of households to see whether households differ in the intensity of their response to uncertainty shocks when split by average household income levels, employee seniority lev-

els, and liquidity. In particular, we may expect low-income households to respond differently to uncertainty shocks relative to high-income. For example, if many low-income households work with more irregular work schedules or with more seasonality in their work agreements with their employers, then they may be more exposed to how uncertain the situation is for the firm they work at (e.g., more concerned about work schedule adjustments and corporate layoffs due to heightened uncertainty). On the other hand, high-income households may have sufficient precautionary savings that allows them to be less affected by changes in uncertainty. Moreover, liquidity levels (from bank account balances) may be a better measure to account for the degree of self-insurance households have when facing uncertainty.

Panel A on the left of Table 6, classifies households into terciles by their annual income levels to examine the response to uncertainty shocks for each household sub-sample. We find that low- and middle-income households are more sensitive to uncertainty shocks compared to higher-income households. Low-income households show an uncertainty sensitivity of consumption of -0.100 (significant at 1%), middle income households a sensitivity of -0.114 (significant at 1%), while high-income households show an insignificant sensitivity of -0.0499. These patterns are indicative that higher income households have better means of buffering potential negative income shocks going forward and thus are less concerned about their idiosyncratic ties to the firm. For example, high-income households may be able to count on additional non-labor related income for rainy days - such as from stock market participation as part of their wealth-, and therefore can better diversify labor risk.

In the middle Panel B of Table 6 we split households into tercile subsamples classifying employees working at the same firm by their annual income levels (i.e., within firm splits). This classification can be interpreted as ranking households according to employee seniority levels - provided income levels and seniority are positively correlated, e.g., a partner at a consultancy firm compared to an entry-level staff member, and that we have a sufficiently large within-firm cross-section of employees to capture enough variation in rankings. Therefore, in Panel B we require firms have at least 50 unique employees in our sample, which

gives us a total of 174 unique employers listed in the stock market. Panel B indicates that high-ranking employees are not sensitive to firm volatility shocks, which is consistent with the story above for Panel A.

Panel C on the right of Table 6 classifies households by their time-varying bank account balances, a measure of liquidity. The results show a monotonically decreasing sensitivity of spending across liquidity groups. Relative to middle- and high-, low-liquidity households cut spending the most in response to uncertainty shocks. Intuitively, households with low liquidity levels lack precautionary savings, and in the presence of increased income uncertainty they have the most incentive to decrease spending to smooth consumption going forward. In this sense, liquidity levels of households offer some degree of self-insurance through precautionary savings. In all, the results in Table 6 indicate that household characteristics, including liquidity, seniority, and income levels, matter for the intensity to which households respond to uncertainty shocks.

3.7 Intensity of Response Across Firm Characteristics

In Table 7, we classify households into terciles based on the characteristics of the firm that employs them. In particular, using common company fundamental and financial data from Compustat and CRSP, we classify households by the most recent year fundamental characteristics of firms. This allows us to examine whether households that work for firms that recently experienced, say, low employment growth (e.g., firms with layoffs) respond differently to uncertainty than households whose employers experienced recent high employment growth (e.g., hiring expansions). We look at 3 main firm characteristics: (1) the most recent annual change in the number of employees working at the firm, (2) Tobin's Q as a measure of investment opportunities of firms (or as ranking value vs growth firms), (3) CAPM β as a measure of risk (i.e., covariance with the market factor and estimated using a 12-month window of daily returns in the preceding calendar year).

From Panel A on the left of Table 7 we find that households that work at firms that

recently had low employment growth are the ones most sensitive to firm uncertainty shocks. Intuitively, employees that may have seen recent layoffs of their colleagues (or at best that the firm is not expanding) would be the ones more concerned about their income going forward, thus the most responsive to uncertainty shocks. Moreover, the same group of households show pronounced sensitivity to the firm's stock returns when compared to the middle and high tercile groups.

Ranking households by firm risk (CAPM β) on the right Panel B of Table 7, we find that households that work for firms with high risk are the ones most sensitive to both uncertainty shocks and firm returns. Moreover, we also find that households working at firms with low Tobin's Q (i.e., low investment opportunity firms) are the most responsive to both 2nd moment uncertainty shocks and 1st moment employer stock returns. Collectively, the results in Table 7 suggest that the sensitivity of household behavior with respect to income and labor market uncertainty can vary across the fundamental characteristics of employers.

3.8 Placebo Tests

The results so far show a robust response of household spending to employer uncertainty shocks. However, despite the controls in our regression and robustness checks discussed above, there could still be concerns that our results are spurious and/or driven by other factors. To alleviate some of these concerns and test whether our results are truly driven by the idiosyncratic link of household to their employers, we perform falsifications test in this section.[14]

We conduct the experiment of replacing the true employers of the households in our sample with placebo employers. The idea is that if households are perfectly insured against uncertainty shocks uniquely originating from placebo employers we should not find any response of household spending to placebo firm's uncertainty shocks, - e.g., no reason why an employee at Microsoft (ticker MSF) would care about the firm-specific uncertainty of,

[14]these tests also help confirm the matching done from household data to employer data

say, fashion clothing firm Abercrombie & Fitch Co (ANF), shoe store The Foot Locker, Inc. (FL), or restaurant Chipotle Mexican Grill, Inc. (CMG). We conduct the experiment in Table 8, where we show the results from 50 iterations of random mapping of households to placebo firms. In particular, in columns (2) and (4) we show the average coefficients and standard errors from 50 regressions based on random matches (with different seeds and with replacement from a pool of over 1,700 placebo firms with required return and volatility data in our sample). As shown, regardless of whether firm uncertainty is measured using option-implied, column (2), or realized volatility, (4), we find no evidence of household spending response to placebo employers. Moreover, in bottom rows of Table 8 we also report the number of times from the 50 placebo regressions where we observed significant (at the 5%) negative coefficients on the placebo volatility shock and at the same time positive coefficients on the placebo firm stock return. This occurs zero times in the realized volatility column (4) and once in the option-implied column (2).[15] Column (4) indicates that not even once by random chance did placebo regressions give us the directions and significance obtained from our baseline regressions that use the true employers. These results largely validate that our findings throughout the paper are, indeed, driven by the idiosyncratic link of household to their true employers,

4 Conclusion

We examine consumer spending behavior in the presence of uncertainty by exploiting daily household information that includes checking, savings, debit and credit card transactions linked to a popular online aggregator service. By leveraging the recent advances of big data we overcome some of the limitations faced by researchers in the past attempting to understand both whether and to what extent do households respond to uncertainty.

Recent rare events such as the Great Recession of 2008-09 and the COVID-19 pandemic

[15] note that we did not restrict the pool of placebo employers to exclude firms in the same industry of the true employers, to which they may be correlated

have unfolded with increased uncertainty, historical spikes in job losses and unemployment rates, and large movements in asset prices. By linking households to employers listed in the US stock market we examine the behavior of households in response to fluctuations in employer-specific uncertainty, as measured by forward-looking option-implied volatility.

We provide novel elasticities of consumption to uncertainty shocks not only for a broad consumption measure, but also for different categories of goods and services purchased (e.g., spending at retail, restaurant, groceries, and durables). We find that households engage in both the intensive and extensive margins in adjusting spending in response to increased uncertainty, with discretionary spending at the forefront of sensitivities. Our results suggest that firm-level uncertainty may have stronger effects on the economy than is so far understood.

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Figure 1. Mapping of households to public firms

This figure shows the number of unique households in the linked-account aggregator data that are mapped to unique publicly listed firms (employers) having financial reports (Compustat), returns (CRSP), and option-implied volatilities (OptionMetrics). We map households first to Compustat firms and link 92,259 households to 2,169 firms. Our regression analysis further requires data from OptionMetrics and CRSP. After filters and imposing data requirements, our baseline regression sample that uses option-implied data from OptionMetrics (as in Table 2) has 49,294 households linked to 763 firms. When measuring firm uncertainty shocks using realized volatility from CRSP, we have 51,638 households and 939 firms in the baseline results.

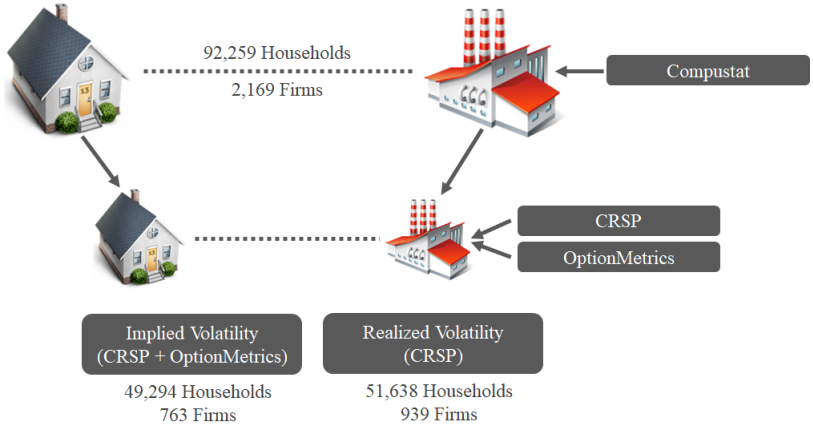


Figure 2. Distribution of annual income

This figure presents the distribution of annual income for households in our employee-employer sample (blue) and the 2011 U.S. Census (red). Note that income in our sample is after withholdings, such as income taxes, healthcare contributions, and retirement 401(k) contributions. These omissions understate the actual household income, before withholdings. Nonetheless, our sample includes households ranging in income across the US income distribution.

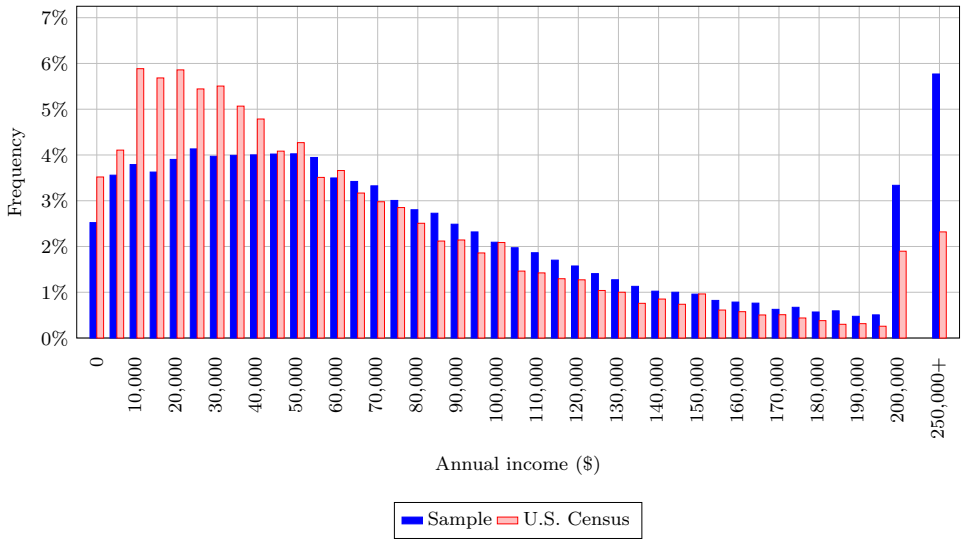
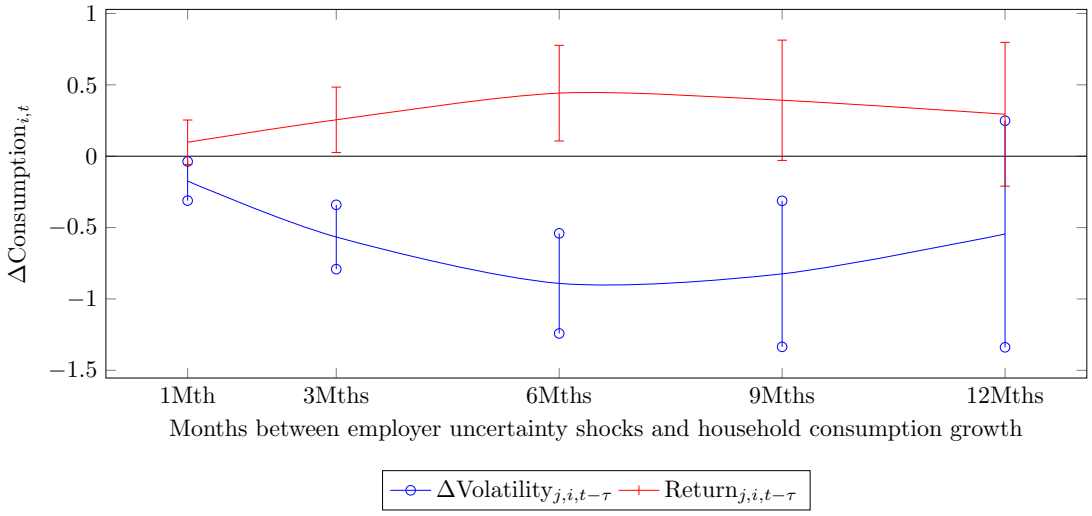


Figure 3. Household spending response to firm uncertainty shocks and returns

Figure A shows the percent change (y-axis) in future average household monthly spending (measured using different windows) in response to employer uncertainty shocks (in blue) and stock returns (in red). The results for the baseline 6-month forecasts as implied by the employee-employer panel regression in equation (1) presented in column (4) in Table 2 are plotted here where the x-axis equals τ=6 months. Note that to ease comparison of effects across variables and across the different forecasted windows, the effects shown are from the standardized regressors for volatility shocks, returns, and controls. In all other horizons (τ=1,3,9,12 months) spending, firm variables, and controls are measured using the window specified on the x-axis, i.e., adjusting the timing of variables in equation 1. For instance, at the horizon of τ=1 month we present the results from regressing the month-on-month changes in household spending on month-on-month changes in employer volatility (lagged by 1-month), 1 month stock return (also lagged), and the month-on month change in household income (measured concurrently to household spending). The vertical lines represent 95% confidence intervals. Figure B shows the magnitude of the effects of both volatility and firm returns as a fraction of the effect of an income shock as reflected in the households' bank account. For instance, the baseline 6-month results in column (4) in Table 2 indicate that the magnitude of the negative effect of a standard deviation increase in firm volatility growth is roughly 1/5 of the effect of an income shock of size 1 standard deviation.

Panel A: Spending Response



Panel B: Magnitude Relative to Income

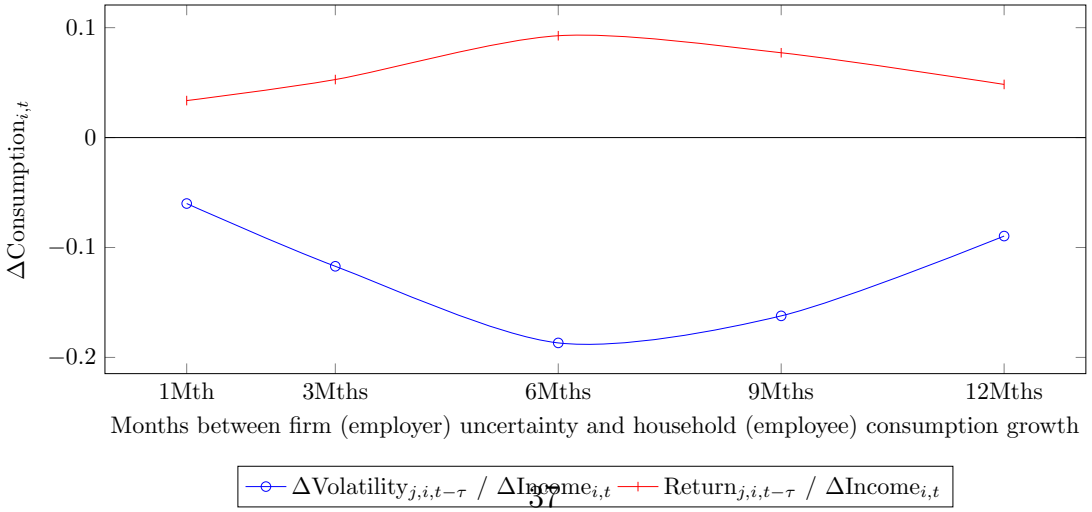


Figure 4. Spending categories and firm uncertainty

This figure shows the percent change (y-axis) in household average monthly spending over the next 6-months in response to employer-specific uncertainty shocks. The effects are as implied by the employee-employer panel regression in equation (1) and in response to a 1 standard deviation increase in firm volatility. The legends on the x-axis specify the spending category and the vertical lines represent 95% confidence intervals. Category durable includes spending at stores related to home items, home-improvement, and home-maintenance, and automobile parts and repairs. Retail broadly includes both goods and services (durable and non-durable). Implied effects account for employer stock returns (to disentangle between first and second moment effects of uncertainty), income shocks directly affecting the budget constraint of households at time of spending, home price index from Zillow measured at the county level for each household, firm-, household-, and time-fixed effects. Standard errors are clustered at the firm (employer) level.

Table 1. Summary statistics

This table shows the summary statistics of variables used in the main regression analysis. Frequency of all variables is monthly. Consumption$_{i,t}$ is the 6-month average monthly spending at retail, restaurant, and grocery stores at the household i level (employees in our sample). Similarly, Income$_{i,t}$ is the 6-month average monthly income for each household i. Except for firm returns (implicitly changes in prices), the baseline regression specifications in Table 2 use 6-month changes in the variables presented here. To measure annual uncertainty every month at the employer-level j of each household i, variable Volatility$_{j,i,t}$ uses option-implied volatilities from at-the-money call options (365-day horizon) from OptionMetrics. Moreover, Realized Volatility$_{j,i,t}$ is the employer's annual (365-day) standard deviation of daily CRSP stock returns (cum-dividend). We annualize these realized volatilities to make the mean comparable to option-implied volatilities by multiplying each firms' realized volatility by the square root of 252 (average number of trading days in a year). Employer 6M Return$_{j,i,t}$ is the 6-month CRSP compounded cum-dividend stock return of sample firms.

	Obs.	Mean	S.Dev	P10	P25	P50	P75	P90
Consumption$_{i,t}$	1,218,442	\$3,027	\$3,255	\$340	\$858	\$1,966	\$3,979	\$6,960
Income$_{i,t}$	1,218,442	\$8,602	\$8,706	\$1,824	\$3,490	\$6,218	\$10,420	\$17,160
Volatility$_{j,i,t}$	1,218,442	0.301	0.144	0.163	0.201	0.256	0.360	0.525
Realized Volatility$_{j,i,t}$	1,218,442	0.311	0.116	0.201	0.229	0.278	0.370	0.737
6M Return$_{j,i,t}$	1,218,442	0.080	0.222	-0.186	-0.032	0.085	0.199	0.319

Table 2. Employer uncertainty shocks and future household consumption

This table presents regression results that forecast household (employee) consumption growth using firm (employer) uncertainty shocks, see equation (1). Frequency of all variables is monthly. $\Delta\text{Consumption}_{i,t}$ is the 6-month growth in average monthly spending at retail, restaurant, and groceries at the household i level (employees). For each household we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into to the next 6-months. $\Delta\text{Volatility}_{j,i,t-6}$ in columns (1)-(4) is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome. Columns (5)-(8) use realized stock return volatility to measure uncertainty shocks, and are defined as the 6-month growth in the employer's annual (365-day) standard deviation of daily CRSP stock returns (cum-dividend). To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, 6M $\text{Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. In columns (4) and (8) the continuous independent variables are standardized to make coefficients comparable across regressors and show the effect of a standard deviation increase in the RHS variable. All other columns show the unstandardized coefficients. All variables are winsorized at the 1 and 99 percentiles each month. Firm, household, and time fixed effects are included. The standard errors are clustered at the firm (employer) level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Implied Volatility				Realized Volatility			
	Unstandardized			Standardized	Unstandardized			Standardized
$\Delta\text{Consumption}_{i,t}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta\text{Volatility}_{j,i,t-6}$	-0.108***	-0.098***	-0.095***	-0.891***	-0.038***	-0.035***	-0.043***	-0.827***
	(0.020)	(0.020)	(0.019)	(0.179)	(0.013)	(0.012)	(0.015)	(0.282)
6M $\text{Return}_{j,i,t-6}$		0.017**	0.020***	0.442***		0.014	0.015**	0.351**
		(0.008)	(0.008)	(0.171)		(0.008)	(0.008)	(0.172)
$\Delta\text{Income}_{i,t}$			0.128***	4.77***			0.129***	4.79***
			(0.011)	(0.409)			(0.011)	(0.394)
Home Price Index	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,218,442	1,218,442	1,218,442	1,218,442	1,274,137	1,274,137	1,274,137	1,274,137
R^2	0.151	0.151	0.158	0.158	0.152	0.152	0.159	0.159

Table 3. Firm- and industry-level uncertainty and returns

This table examines the response of household (employee) consumption to uncertainty and stock returns measured at the industry level of the employer, and tests whether the effects of employer-specific uncertainty examined in Table 2 remain after controlling for industry-level effects. Frequency of all variables is monthly. Column (1) presents the baseline specification with controls presented in column (3) of Table 2. Columns (2)-(6) include industry-level measures of volatility shocks and stock returns measured every month by taking the cross-sectional (weighted) average of all firms within the same industry k of the employer j as classified by the Fama-French 49 industry classification. In constructing the industry measures, columns (2)-(4) weight firms by their monthly CRSP market value (shares outstanding time share price), while columns (5)-(6) use equal weights. Results are robust to the Fama-French 30 industry classification and 3- and 4-digit Standard Industry Classification (SIC) codes. $\Delta\text{Consumption}_{i,t}$ is the 6-month growth in average monthly spending at retail, restaurant, and groceries at the household i level (employees). For each household we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into to the next 6-months. $\Delta\text{Volatility}_{j,i,t-6}$ is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome. To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, $\text{6M Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. All variables are winsorized at the 1 and 99 percentiles each month. Firm, household, and time fixed effects are included. The standard errors are clustered at the firm (employer) level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

		Industry Volatility and Returns				
	Baseline	Value-weighted			Equal-weighted	
$\Delta\text{Consumption}_{i,t}$	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\text{Volatility}_{j,i,t-6}$	-0.095***			-0.0873***		-0.0962***
	(0.019)			(0.0226)		(0.0198)
$\text{6M Return}_{j,i,t-6}$	0.020***			0.0194***		0.0233***
	(0.008)			(0.00726)		(0.00745)
$\Delta\text{Income}_{i,t}$	0.128***	0.128***	0.128***	0.128***	0.128***	0.128***
	(0.0110)	(0.0112)	(0.0112)	(0.0112)	(0.0111)	(0.0111)
$\Delta\text{Ind Volatility}_{j\in k,i,t-6}$			-0.203**	-0.0745	-0.0286	-0.00156
			(0.0875)	(0.0841)	(0.0233)	(0.107)
$\text{Ind 6M Return}_{j\in k,i,t-6}$		0.0606**	0.0418*	0.0387	-0.133	-0.0168
		(0.0271)	(0.0238)	(0.0236)	(0.108)	(0.0202)
Home Price Index	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,218,442	1,195,398	1,195,398	1,195,398	1,195,398	1,195,398
R^2	0.158	0.157	0.157	0.157	0.157	0.157

Table 4. Firm- and aggregate-level uncertainty and returns

This table examines the response of household consumption to market-wide uncertainty and stock returns, and tests whether the effects of employer-specific uncertainty examined in Table 2 remain after controlling for aggregate-level effects. Frequency of all variables is monthly. To avoid perfect collinearity between the aggregate variables presented here and our baseline month-year fixed effects used in Table 2 we drop the time fixed effects in this table and allow the aggregate variables to capture the effects arising from common shocks affecting all households at every monthly point in time. Columns (1)-(6) use aggregate-level measures of volatility and stock market returns. To measure aggregate uncertainty, we use the VIX, a measure of stock market expectation of volatility based on S&P 500 forward-looking index options. In measuring aggregate annual uncertainty using the VIX we use a 252-day moving average of VIX daily data. Results are robust to using 6-month changes in the VIX (i.e., VIX shocks) or measuring aggregate volatility from the cross-sectional average of firm-level volatility shocks (either option-implied or realized). To measure aggregate stock market returns columns (1)-(3) use the 6-month compounded value-weighted total stock market return (cum-dividend) from CRSP, while columns (4)-(6) use the 6-month compounded S&P500 return from CRSP. In columns (3) and (6) the timing of both the firm-level and aggregate variables of volatility and returns is the same at $t-6$ months. $\Delta\text{Consumption}_{i,t}$ is the 6-month growth in average monthly spending at retail, restaurant, and groceries at the household i level (employees). For each household we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into to the next 6-months. $\Delta\text{Volatility}_{j,i,t-6}$ is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome. To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, $\text{6M Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. All variables are winsorized at the 1 and 99 percentiles each month. Firm, household, and time fixed effects are included. The standard errors are clustered at the firm (employer) level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$\Delta\text{Consumption}_{i,t}$	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\text{Volatility}_{j,i,t-6}$			-0.530***			-0.532***
			(0.0370)			(0.0373)
$\text{6M Return}_{j,i,t-6}$			-0.0172			-0.00143
			(0.0148)			(0.0143)
$\Delta\text{Income}_{i,t}$	0.155***	0.155***	0.151***	0.154***	0.153***	0.150***
	(0.0111)	(0.0113)	(0.0110)	(0.0115)	(0.0116)	(0.0113)
VIX_{t-6}		-0.608***	0.394**		-0.656***	0.368**
		(0.109)	(0.160)		(0.110)	(0.158)
$\text{Market 6M Return}_{t-6}$	0.223***	0.204***	0.181**			
	(0.0674)	(0.0685)	(0.0775)			
$\text{S\&P500 6M Return}_{t-6}$				0.142*	0.131*	0.102
				(0.0756)	(0.0764)	(0.0826)
Home Price Index	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Month-year FE	No	No	No	No	No	No
Observations	1,218,442	1,218,442	1,218,442	1,218,442	1,218,442	1,218,442
R^2	0.128	0.129	0.133	0.128	0.129	0.133

Table 5. Good and bad employer uncertainty shocks

This table examines the effect of 'good' and 'bad' employer uncertainty shocks on future household (employee) consumption. We test for asymmetric responses to 'bad' (ΔVolatility>0) and 'good' (ΔVolatility$<=0$) employer uncertainty shocks, by interacting the absolute value of the employer uncertainty shock, $|\Delta\text{Volatility}|$, with an employer dummy that takes value $D^{Bad}=1$ if ΔVolatility>0, zero otherwise. Frequency of all variables is monthly. Columns (1) and (3) show the baseline specification with controls presented in columns (3) and (7) of Table 2 that document a negative *average* effect of option-implied and realized firm volatility shocks, respectively. In columns (2) and (4) the coefficient on $|\Delta\text{Volatility}|$ is the slope for good uncertainty shocks, while the coefficient on the interaction $|\Delta\text{Volatility}| \times D^{Bad}$ term is the difference in the slopes for good and bad uncertainty shocks (i.e., a formal test for the asymmetric response of household spending to bad uncertainty shocks relative to good shocks). The sum of those 2 coefficients is the slope for bad uncertainty shocks (i.e., effect of bad uncertainty on household spending). The less meaningful coefficient on the dummy D^{Bad} simply captures difference in the effects between good and bad uncertainty shocks at a zero starting value of $|\Delta\text{Volatility}|=0$ (i.e., the difference in the intercept between the slopes of good and bad uncertainty shocks). $\Delta\text{Consumption}_{i,t}$ is the 6-month growth in average monthly spending at retail, restaurant, and groceries at the household i level (employees). For each household we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into to the next 6-months. $\Delta\text{Volatility}_{j,i,t-6}$ in columns (1)-(2) is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome. Columns (3)-(4) use realized stock return volatility to measure uncertainty shocks, and are defined as the 6-month growth in the employer's annual (365-day) standard deviation of daily CRSP stock returns (cum-dividend). To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, 6M $\text{Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. All variables are winsorized at the 1 and 99 percentiles each month. Firm, household, and time fixed effects are included. The standard errors are clustered at the firm (employer) level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Implied Volatility		Realized Volatility	
$\Delta\text{Consumption}_{i,t}$	Baseline (1)	Good & Bad (2)	Baseline (3)	Good & Bad (4)
$\Delta\text{Volatility}_{j,i,t-\tau}$	-0.0954***		-0.0432***	
	(0.0192)		(0.0147)	
$\lvert\Delta\text{Volatility}_{j,i,t-\tau}\rvert$		0.000321		0.0297**
		(0.0509)		(0.0144)
$\lvert\Delta\text{Volatility}_{j,i,t-\tau}\rvert \times \text{D}^{Bad}_{j,i,t-\tau}$		-0.225***		-0.103***
		(0.0427)		(0.0291)
$\text{D}^{Bad}_{j,i,t-\tau}$		0.00354		0.00403
		(0.00429)		(0.00293)
$\text{Return}_{j,i,t-\tau}$	0.0199***	0.0181**	0.0153**	0.0149**
	(0.00771)	(0.00735)	(0.00750)	(0.00744)
Controls	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	1,218,442	1,218,442	1,274,137	1,274,137
R^2	0.158	0.158	0.159	0.159

Table 6. High- & low-income households, within-firm seniority, and high- & low household bank balances

This table examines differences in intensity of the response of future household (employee) consumption to firm (employer) uncertainty shocks by household characteristics. Frequency of all variables is monthly. Panel A on the left classifies households into terciles by their annual income levels every year. Panel B in the middle ranks employees working at the same publicly-listed firm by their annual income levels (i.e., within firm splits). This classification can be interpreted as ranking households according to employee seniority levels - provided income levels and seniority are positively correlated, e.g., a partner at a consultancy firm compared to an entry-level staff member, and that we have a sufficiently large within-firm cross-section of employees to capture enough variation in rankings. Therefore, Panel B requires firms have at least 50 unique employees in our sample (for a total of 174 unique employers listed in the stock market). Panel C on the right splits households by time-varying bank account balances, a measure of liquidity. Consumption is the baseline 6-month growth in average monthly spending presented in Table 2 ($\Delta\text{Consumption}_{i,t}$), which includes retail, restaurant, and groceries spending at the household i level (employees). For each household we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into to the next 6-months. $\Delta\text{Volatility}_{j,i,t-6}$ is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome. To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, $\text{6M Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. All variables are winsorized at the 1 and 99 percentiles each month. Firm, household, and time fixed effects are included. The standard errors are clustered at the firm (employer) level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	A: Income splits			B: Within-firm income (seniority)			C: Bank-account balance (liquidity)		
	Low-income		High-income	Low-income		High-income	Low-balance		High-balance
$\Delta\text{Consumption}_{i,t}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\Delta\text{Volatility}_{j,i,t-6}$	-0.100***	-0.114***	-0.0499	-0.108***	-0.146***	-0.0506	-0.129***	-0.0765**	-0.0712**
	(0.0296)	(0.0326)	(0.0343)	(0.0322)	(0.0313)	(0.0436)	(0.0341)	(0.0329)	(0.0331)
$\text{6M Return}_{j,i,t-6}$	0.0166*	0.0173**	0.0183	0.0223*	0.0214**	0.0253*	0.0235***	0.00699	0.0246*
	(0.00903)	(0.00874)	(0.0116)	(0.0125)	(0.00894)	(0.0140)	(0.00905)	(0.0114)	(0.0135)
$\Delta\text{Income}_{i,t}$	0.231***	0.146***	0.0739***	0.208***	0.154***	0.0823***	0.237***	0.142***	0.0509***
	(0.0123)	(0.0114)	(0.00714)	(0.0124)	(0.0132)	(0.00891)	(0.0167)	(0.00749)	(0.00645)
Home Price Index	Yes	Yes	Yes	Yes	Yes	Yes			
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	404,732	404,512	405,483	360,370	359,835	360,499	405,292	404,915	405,697
R^2	0.224	0.217	0.197	0.215	0.231	0.204	0.221	0.232	0.183

Table 7. Consumption response to uncertainty shocks, by firm characteristics

This table examines differences in intensity of the response of future household (employee) consumption to firm (employer) uncertainty shocks by employer characteristics. In particular, using common company fundamental and financial data from Compustat and CRSP we classify households by the characteristics of firms in the preceding year. This allows us to examine whether households that work for firms that recently experienced, say, low employment growth (e.g., firms with layoffs) respond differently to uncertainty than households whose employers experienced recent high employment growth (e.g., hiring expansions). We look at 3 main firm characteristics to classify households: (A) the most recent annual change in the number of employees measured at the employer-level (variable EMP from Compustat), (B) Tobin's Q, and (C) CAPM β as a measure of firm risk (i.e., covariance with the stock market factor) estimated using a 12-month window of daily returns in the preceding calendar year. Frequency of all variables is monthly. The dependent variable is the baseline 6-month growth in average monthly spending in Table 2 (ΔConsumption$_{i,t}$), which includes retail, restaurant, and groceries spending at the household i level (employees). In particular, for each household we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into to the next 6-months. ΔVolatility$_{j,i,t-6}$ in columns is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome. To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, 6M Return$_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where ΔIncome$_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. All variables are winsorized at the 1 and 99 percentiles each month. Firm, household, and time fixed effects are included. The standard errors are clustered at the firm (employer) level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	A: Employment growth			B: Tobin's Q			C: CAPM β		
	Low		High	Low		High	Low		High
ΔConsumption$_{i,t}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ΔVolatility$_{j,i,t-6}$	-0.106***	-0.0518	-0.0398	-0.0817***	-0.0496	-0.0759	-0.0797	-0.0491	-0.0607**
	(0.0223)	(0.0642)	(0.0613)	(0.0271)	(0.0506)	(0.0829)	(0.0523)	(0.0723)	(0.0278)
6M Return$_{j,i,t-6}$	0.0278***	0.000231	0.0167	0.0236***	0.00108	0.0143	0.0134	0.0112	0.0201**
	(0.0106)	(0.0130)	(0.0149)	(0.00891)	(0.0120)	(0.0169)	(0.0148)	(0.0156)	(0.00849)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	416,697	400,488	382,766	420,968	389,960	393,058	423,593	394,763	385,233
R^2	0.230	0.276	0.253	0.174	0.200	0.200	0.229	0.269	0.207

Table 8. Placebo tests: mapping households to random placebo firms

This table shows results from placebo falsification tests. We replace the true employer of the household in our sample with a placebo employer, where the null is that there is no response from household consumption to placebo employer uncertainty shocks. Placebo columns report the average regression estimates from 50 iterations of random mapping of households to placebo firms. In particular, under Placebo columns (2) and (4), we show the average coefficients and standard errors from 50 regressions based on random matches (with different seeds and with replacement from a pool of over 1,700 placebo firms with required data in our sample). Row "Count: Vol & Return" reports the number of times from the 50 placebo regressions that saw significant (at the 5%) negative coefficients on the placebo volatility shock and at the same time positive coefficients on the placebo stock return. Columns (1) and (3) report the baseline results with controls presented in columns (3) and (7) in Table 2. Frequency of all variables is monthly. $\Delta\text{Volatility}_{j,i,t-6}$ in columns (1)-(2) is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome. Column (3)-(4) uses realized stock return volatility to measure uncertainty shocks, and are defined as the 6-month growth in the employer's annual (365-day) standard deviation of daily CRSP stock returns (cum-dividend). To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, $\text{6M Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. All variables are winsorized at the 1 and 99 percentiles each month. Firm, household, and time fixed effects are included. The standard errors are clustered at the firm (employer) level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Implied Volatility		Realized Volatility	
$\Delta\text{Consumption}_{i,t}$	Sample (1)	Placebo (2)	Sample (3)	Placebo (4)
$\Delta\text{Volatility}_{j,i,t-6}$	-0.095***	-0.009	-0.043***	0.003
	(0.019)	(0.026)	(0.015)	(0.014)
$\text{6M Return}_{j,i,t-6}$	0.020***	-0.003	0.015**	-0.004
	(0.008)	(0.007)	(0.008)	(0.007)
Controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Count: Vol & Return		1/50		0/50
Observations	1,218,442	1,218,442	1,274,137	1,274,137
R^2	0.158	0.158	0.159	0.159

Appendix For Online Publication

Online appendix for "Firm Uncertainty and Household Spending, by Iván Alfaro and Hoonsuk Park (2019).

Figure A.1. Distribution of sample firms by their characteristics

This figure shows the distribution of public firms in our regression sample according to their A) number of employees, B) market equity (in Billions of US$), C) Tobin's Q, D) book-to-market equity ratio, E) CAPM β (i.e., covariance with the stock market factor), and F) investment rate (measured as the ratio of capital expenditures to lagged net property, plant, and equipment from Compustat).

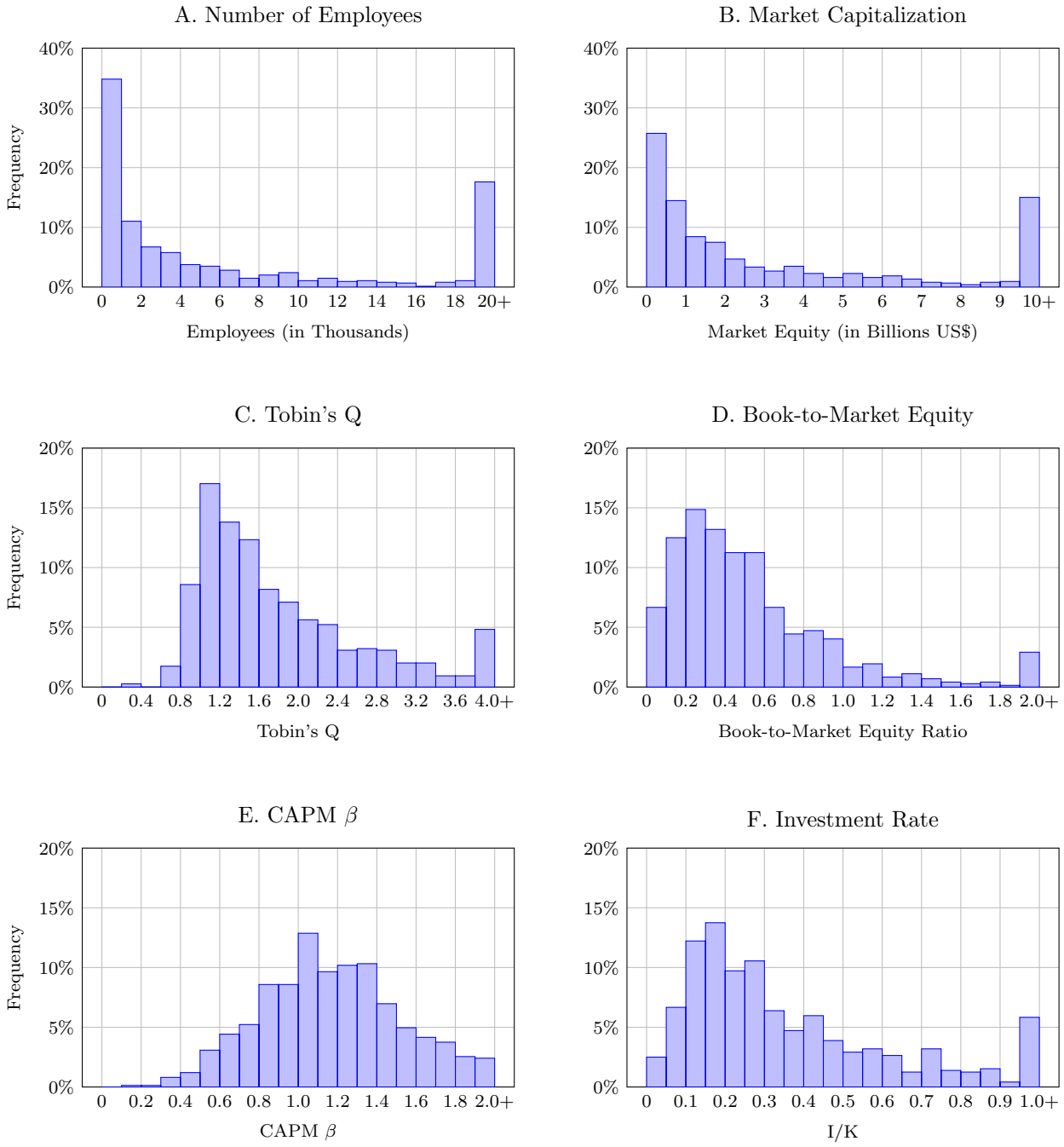


Table A.1. Robustness: Firm uncertainty shocks and household spending, alternative specifications

This table shows robustness tests to the baseline results presented in Table 2 that forecast household (employee) consumption growth using firm (employer) uncertainty shocks, see equation (1). Robustness checks include altering either the dimension(s) of fixed effects in each specification (e.g., including industry fixed effects) and/or the dimension(s) over which the standard errors are clustered in each regression (e.g., clustering in 2 different dimensions instead of only at the firm-level). The fixed effects and clustering dimensions are specified at the bottom of the Table. Standard errors are reported in parentheses. Columns (1) and (1A) present the baseline specifications with controls presented in columns (3) and (7) in Table 2, which use either option-implied or realized volatility -respectively- to measure uncertainty shocks at the employer level. Frequency of all variables is monthly. $\Delta\text{Consumption}_{i,t}$ is the 6-month growth in average monthly spending at retail, restaurants, and groceries at the household i level (employees). For each household we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into to the next 6-months. In columns (1), (2), (3), (4), (5), $\Delta\text{Volatility}_{j,i,t-6}$ is the 6-month growth in the *option-implied* volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household, over the six month period preceding the consumption growth. Similarly, in columns (1A), (2A), (3A), (4A), (5A), $\Delta\text{Volatility}_{j,i,t-6}$ is the lagged 6-month growth in the firm annual (365 day) *realized* volatility of the firm's CRSP stock return. The timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome. To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, $\text{6M Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. All variables are winsorized at the 1 and 99 percentiles each month. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Implied Volatility					Realized Volatility				
$\Delta\text{Consumption}_{i,t}$	(1)	(2)	(3)	(4)	(5)	(1A)	(2A)	(3A)	(4A)	(5A)
$\Delta\text{Volatility}_{j,i,t-6}$	-0.0954***	-0.0954***	-0.0975***	-0.0954***	-0.0954***	-0.0432***	-0.0432***	-0.0439***	-0.0432***	-0.0432**
	(0.0192)	(0.0241)	(0.0238)	(0.0253)	(0.0249)	(0.0147)	(0.0160)	(0.0159)	(0.0110)	(0.0170)
$\text{6M Return}_{j,i,t-6}$	0.0199***	0.0199**	0.0197**	0.0199***	0.0199**	0.0153**	0.0153**	0.0150**	0.0153***	0.0153*
	(0.00771)	(0.00787)	(0.00788)	(0.00609)	(0.00835)	(0.00750)	(0.00742)	(0.00741)	(0.00531)	(0.00802)
$\Delta\text{Income}_{i,t}$	0.128***	0.128***	0.128***	0.128***	0.128***	0.129***	0.129***	0.129***	0.129***	0.129***
	(0.0110)	(0.0113)	(0.0113)	(0.00440)	(0.0125)	(0.0106)	(0.0110)	(0.0110)	(0.00438)	(0.0122)
Home Price Index	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Industry FE	No	No	Yes	No	No	No	No	Yes	No	No
SE Clustering - Firm	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
SE Clustering - Household	No	No	No	Yes	No	No	No	No	Yes	No
SE Clustering - Industry	No	No	No	No	Yes	No	No	No	No	Yes
SE Clustering - Time	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Observations	1,218,442	1,218,442	1,218,443	1,218,442	1,218,442	1,274,137	1,274,137	1,274,137	1,274,137	1,274,137
R^2	0.158	0.158	0.157	0.158	0.158	0.159	0.159	0.158	0.159	0.159

Table A.2. Robustness: Firm uncertainty measured in shocks and in levels, lagged and current

This table shows robustness to modifying the functional form and timing of the baseline employer uncertainty variable presented in Table 2. In particular, we test for robustness of (employer) volatility (from forward-looking options) when measured either in shocks or levels and either lagged or contemporaneously to household (employee) consumption growth. Column (1) presents the baseline specification with controls presented in column (3) in Table 2. In column (1) the timing of these employer uncertainty shocks is lagged by a full 6-months with respect to the LHS outcome, while in column (3) the timing is measured concurrently to the outcome. Columns (2) and (4) present the effects of employer volatility measured in levels instead of shocks. However, the timing of the volatility in level is lagged by 6-months in column (2) while contemporaneous to the outcome variable in column (4). Frequency of all variables is monthly. $\Delta\text{Consumption}_{i,t}$ is the 6-month growth in average monthly spending at retail, restaurant, and groceries at the household i level (employees). For each household we measure consumption every month over a 6-month period, obtain the average monthly consumption over this span, and construct the growth into to the next 6-months. $\Delta\text{Volatility}_{j,i,t-6}$ is the 6-month growth in the option-implied volatility (365-day horizon from OptionMetrics) of the corresponding employer j of each household. To disentangle between the predictive effect of 2nd moment uncertainty shocks and first moment effects, we control for the lagged stock return of the employer, $\text{6M Return}_{j,i,t-6}$, defined as the CRSP compounded 6-month cum-dividend stock return. We further control for household income shocks directly affecting the budget-constraint of households at time of spending, where $\Delta\text{Income}_{i,t}$ is the 6-month change in average monthly household income measured analogously and contemporaneously to consumption growth. To account for differences in the cost-of-living across households located in different counties across the U.S, all specifications include as control a monthly home price index from Zillow measured at the county level for each household. All variables are winsorized at the 1 and 99 percentiles each month. Firm, household, and time fixed effects are included. The standard errors are clustered at the firm (employer) level and are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$\Delta\text{Consumption}_{i,t}$	(1)	(2)	(3)	(4)
$\Delta\text{Volatility}_{j,i,t-6}$	-0.0954***			
	(0.0192)			
$\text{Volatility}_{j,i,t-6}$		-0.0579*		
		(0.0349)		
$\Delta\text{Volatility}_{j,i,t}$			-0.0926***	
			(0.0222)	
$\text{Volatility}_{j,i,t}$				-0.180***
				(0.0561)
$\text{6M Return}_{j,i,t-6}$	0.0199***	0.0262***	0.0201**	0.0209***
	(0.00771)	(0.00858)	(0.00811)	(0.00768)
$\Delta\text{Income}_{i,t}$	0.128***	0.128***	0.129***	0.129***
	(0.0110)	(0.0110)	(0.0109)	(0.0109)
Cost of Living Index	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	1,218,442	1,226,864	1,225,188	1,230,053
R^2	0.158	0.158	0.158	0.158