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Firm uncertainty and households: Spending, savings, and risks☆

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ABSTRACT

Using daily banking and credit card data for thousands of households linked to U.S. publicly listed employers, we find novel evidence that firm-specific uncertainty persistently reduces future spending and spurs precautionary savings. A one-standard-deviation rise in option-implied firm volatility—akin to the S&P 500 VIX—predicts a $106 monthly spending drop (8 hours of wages) and a $193 increase in bank balances, reflecting notable cutbacks in typical non-durable goods and services. The mechanism operates through heightened household risks: firm uncertainty expands both income and consumption risk over the next year, with the largest effects among lower and top earners (notably the top 1%). Employers only partly shield earnings, while households only partly self-insulate consumption risk via smoothing channels. Detrimental uncertainty effects on households are stronger than firm stock price declines.

1. Introduction

A growing body of literature examines whether fluctuations in uncertainty affect economic behavior. For *firms*, a classic channel is real options (Bernanke, 1983; Bloom, 2009), where uncertainty makes firms cautious in investment and hiring decisions, as these actions are costly to reverse—raising the option value of waiting. For *consumers*, daily spending and saving decisions are shaped by uncertainty, as households with a precautionary savings motive can adjust these actions, spending cautiously and building savings buffers, to better sustain their future consumption in bad times (Kimball, 1990; Deaton, 1991; Carroll, 1992; Gourinchas and Parker, 2002). Understanding how employer-specific uncertainty shapes household behavior is especially salient today, as recent episodes—from the 2008–09 Great Recession and the COVID-19 pandemic to surging global tensions, including wars and escalating trade disputes—highlight its intertwined role in shaping both supply and demand.

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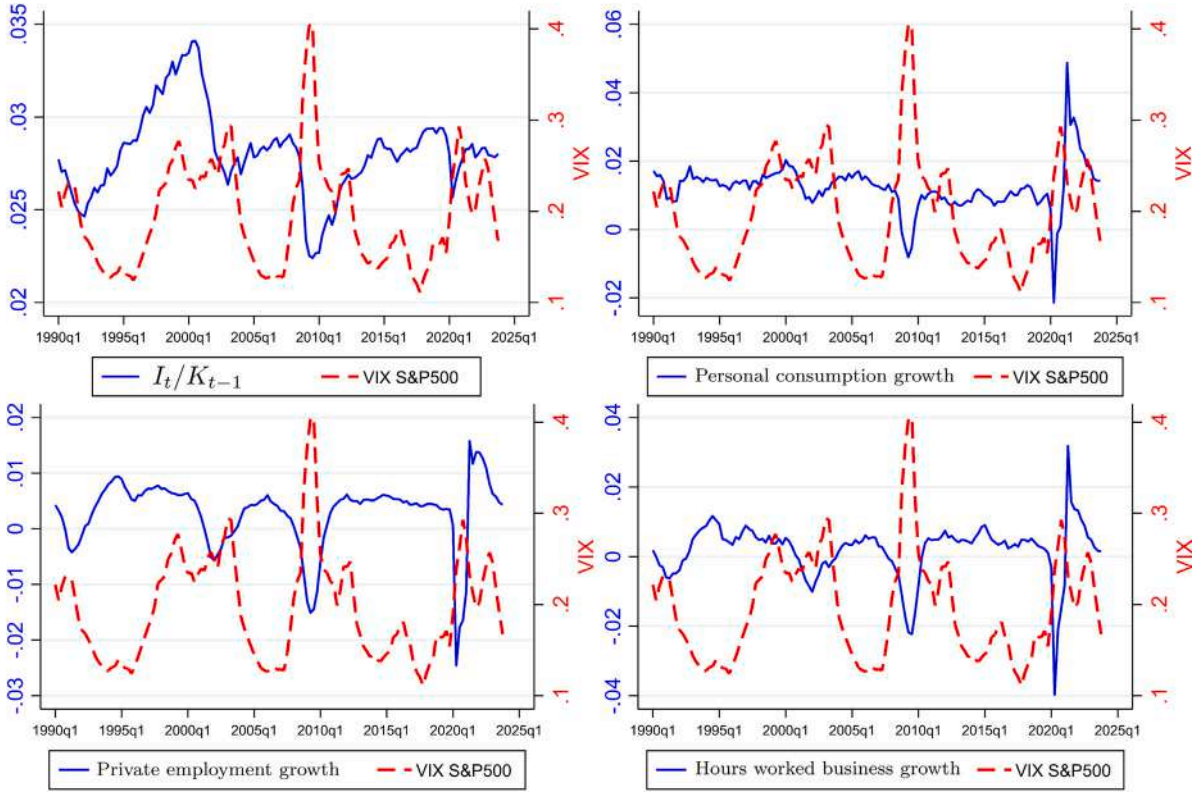

Fig. 1. Uncertainty and aggregate investment, consumption, employment, hours worked, 1990Q1-2023Q4.
Notes: Plotted aggregate quarterly series are from 1990 Q1 to 2023 Q4. Quarterly aggregate investment to capital ratios, I_t/K_{t-1}, follow Bachmann et al. (2013) and use private fixed nonresidential investment and capital stocks from the BEA. US aggregate consumption are Personal Consumption Expenditures (variable PCE) from FRED, billions of US Dollars, quarterly seasonally adjusted. US total private employees are All Employees, Total Private (variable USPRIV) from FRED, quarterly seasonally adjusted. Hours worked are Business Sector: Hours Worked for All Employed Persons (variable HOABS) from FRED, quarterly seasonally adjusted. Growth rates are 4-quarter moving averages of quarterly changes. VIX is the 4-quarter moving average of the option-implied volatility of the S&P 500.

The importance of uncertainty for both employers and consumers is evident in the aggregate data. Figs. 1 and 2 illustrate the relationship between key business cycle aggregates and the CBOE Volatility Index (VIX)—the leading benchmark for uncertainty implied by call and put options of all S&P 500 firm constituents. Fig. 1 shows that periods of high firm uncertainty are associated with strong cyclical declines in corporate investment, personal consumption, employment, and hours worked. In Fig. 2, the negative relationship with consumption growth is also visible when aggregate spending is decomposed into major categories: non-durable goods, services, and durable goods. In contrast, personal savings growth shows a positive correlation with the VIX—strongly tracking it both during and after the substantial spikes seen in the Great Recession and the COVID-19 pandemic—indicating strong precautionary motives for households and the buildup of savings buffers.

Motivated by these aggregate correlations, we examine the micro-level spending and saving behavior of thousands of anonymized households in response to employer-specific uncertainty originating from hundreds of publicly listed U.S. firms. Despite their importance, evidence of these day-to-day relationships remains undocumented due to data limitations, including observing daily household decisions and identifying exogenous shocks that create measurable uncertainty for households. We fill this gap by using transaction-level data at the point of purchase—e.g., a US $15 purchase at Starbucks—and as registered in banking records, providing first estimates of spending and savings sensitivities and their persistence in response to firm uncertainty, including by non-durables and services, and for different savings measures, including liquid assets and transfers into brokerage accounts.

To understand these responses, we construct novel worker-level measures of consumption and income risks—measured from future 12-month standard deviations of monthly growth rates—to examine how these household risks expand following increases in firm uncertainty. The consumption risk measures represent a novel contribution, as these critical monthly statistics have remained elusive in the household finance literature.[1] Consumption risk is a sufficient statistic for all sources of household risk, including earnings risk which, although important for most people and measurable in our data, is not the only firm-related risk employees face through employers, especially for top earners whose compensation schemes tend to include large incentives beyond salary. Moreover, our large sample approach allows examining whether risk expansions vary systematically across worker earnings levels, with potentially pronounced effects among both lowest and highest earners—such as C-suite executives at the top 1% of earners in NYSE-listed firms. Further, by comparing the size of expanded risks, we can assess the extent to which firms insure workers against future income risk and households' ability to self-insulate consumption risk through smoothing mechanisms.

To capture fluctuations in employer uncertainty, we exploit forward-looking volatility expectations derived from listed firms' options data. These firm-specific measures are available in near real-time and are analogous to the market-wide, option-implied VIX.[2] These measures

[1] Unlike administrative data (e.g., Norwegian population data), where consumption is only inferred annually from budget constraints, or U.S. credit bureau data limited to large, infrequent purchases (houses or cars) occurring every few years or decades, our data capture daily, granular spending patterns.

[2] Implied volatility provides the market's best real-time estimate of expected volatility and is more precise than realized volatility (Jorion, 1995; Christensen and Prabhala, 1998; Campa and Chang, 1998). An et al. (2014)

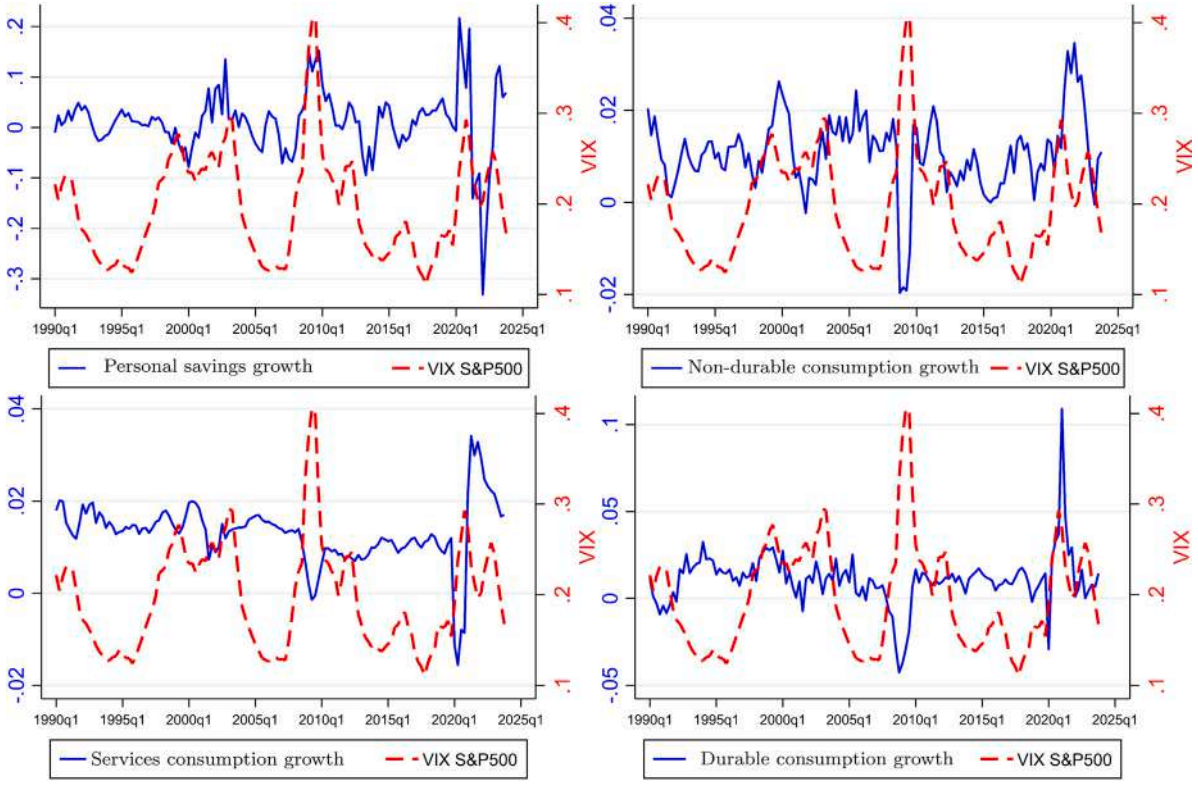

Fig. 2. Uncertainty, personal savings and consumption of non-durables, services, and durables, 1990Q1-2023Q4.
Notes: Plotted aggregate quarterly series are from 1990 Q1 to 2023 Q4. US personal savings are Net Private Savings (variable W202RC1Q027SBEA) from FRED, Billions of US Dollars, quarterly seasonally adjusted. US non-durable goods consumption are Personal Consumption Expenditures: Nondurable Goods (variable PCEND) from FRED, seasonally adjusted. US services consumption are Personal Consumption Expenditures: Services (variable PCES) from FRED, seasonally adjusted. US durable goods consumption are Personal Consumption Expenditures: Durable Goods (variable PCEDG) from FRED, seasonally adjusted. Growth rates are 4-quarter moving averages of quarterly changes. VIX is the 4-quarter moving average of the option-implied volatility of the S&P 500.

are better suited than backward-looking realized volatilities for capturing shifts associated with sudden movements in expected volatility that economic agents—employees, shareholders, managers, and policymakers alike—perceive in the economy.

Results. Section 3 examines how firm uncertainty forecasts fluctuations in both firm and household choices up to one year ahead. On the supply side, firms cut investment in physical and intangible capital, reduce employment, and increase cash holdings—indicating real detrimental impacts and cautious financial positioning through corporate precautionary savings. On the demand side, households confronted with heightened employer uncertainty behave cautiously by reducing spending and increasing savings. The micro data show an elasticity of spending to firm uncertainty shocks of −0.10, implying that a doubling of a firm's 365-day forward volatility is associated with a 10% decline in average monthly spending over the next quarter.[3] In dollar terms, a standard deviation increase in firm volatility depresses monthly spending by US$106, with adjustments persisting for up to 12 months.

These cautious adjustments vary based on expenditure discretion. Granular categories like entertainment and travel show sizable negative responses, while less discretionary spending, such as insurance and medical expenses—which households likely cut last—is least responsive. We observe substitution effects between related categories: households spend more on groceries while simultaneously reducing restaurant expenditures. Crucially, broad categories of non-durables and services, like those in Fig. 2, experience significant reductions, showing cautious behavior extends beyond lumpy durable goods purchases.

Turning to precautionary savings behavior and mirroring the positive aggregate patterns of Fig. 2, we find households increase savings when facing uncertainty. A standard deviation increase in firm volatility predicts a cash buildup of US$193 in monthly bank balances over the next quarter—roughly 14 hours worth of wages per month. This savings increase notably offsets the decrease in total spending, jointly evidencing precautionary behavior against potential income disruptions. Transfers to brokerage accounts also slightly rise, though these responses are smaller compared to liquid savings—likely reflecting a preference to avoid future withdrawal costs and delays applicable to retirement or investment accounts.

The micro data also indicates that households respond more intensely to firm uncertainty than to returns. While positive firm returns only offset about half of the negative uncertainty effects on spending, poor firm returns can crucially combine with uncertainty to exacerbate the damaging effects—e.g., in turbulent market times, crashing firm prices combined with jumps in forward-looking firm volatility can jointly cause large adverse effects on households.

Having documented a forecastable and persistent response of household spending and precautionary savings, Section 4 addresses the question of why we observe these responses. The answer is simple: rising firm uncertainty translates into higher future household risks.

find it predicts stock returns by capturing information missed by backward-looking measures. Altig et al. (2020) discuss the preference for forward-looking measures to capture evolving uncertainty during the COVID-19 pandemic.

[3] Netflix exemplifies volatility increases: in Q2 2022, after reporting its first subscriber loss (200,000) since 2011, its implied volatility roughly doubled from 0.30 to 0.60, its stock value dropped 30%, and layoffs followed next quarter (450 employees). Our strategy: (1) disentangles second-moment volatility shocks from first-moment return effects, (2) captures both uncertainty and household spending fluctuations over comparable three-month periods, and (3) reflects typical volatility fluctuations rather than extreme outliers.

Examining the distributional properties of income and spending dynamics using the non-parametric approach of Guvenen et al. (2014), we find firm uncertainty shocks correspond to lower future first and third moments of household income and spending growth distributions. This indicates reduced mean growth rates and relatively left-skewed distributions for employees at highly uncertain employers—where the negative skewness reflects an expansion of poorer future outcomes in the left tail of household distributions. These results reveal a novel connection between the highly prominent yet seemingly disconnected Bloom (2009)-style firm uncertainty and Guvenen et al. (2014)-style household income literatures, showing how firm uncertainty generates stylized patterns in household earnings studies.

Beyond these distributional shifts in the growth rates of income and spending, our novel monthly measures of worker-level income and consumption risks—measured by tracking workers' future 12-month standard deviations of monthly growth rates (i.e., second moment household measures)—show significant expansions in these critical household risks. Notably, earnings risk rises by 20% for workers tied to volatile firms compared to those at more stable employers. Furthermore, despite households' access to smoothing mechanisms, consumption risk still rises by an economically sizable and statistically significant 7% in the next year.

These risk expansions vary systematically across the earnings distribution, revealing heterogeneous risk pass-throughs with a distinctive U-shaped pattern. Household risks increase from low to high firm uncertainty for nearly all earnings percentiles, with pronounced effects on both the lowest and highest earners. This pattern likely reflects greater variability in complex bonus structures at higher income levels, and differences in employment adjustment margins for lower-income workers. Comparing the transmission of this U-shaped pattern from earnings to consumption risk reveals two key findings: smoothing mechanisms are effective (the U-shape weakens), yet firm uncertainty creates fundamental consumption risk that is not fully mitigated (the pattern persists), even among very high-income households.

Related literature. Following the seminal work on uncertainty by Bloom (2009), and its timely importance for understanding the Great Recession of 2008–2009, a growing body of work has focused on measuring and quantifying the effect of uncertainty on the business cycle (e.g., Baker et al. (2016), Bloom et al. (2018), Jurado et al. (2015) and Berger et al. (2020)). For firms, a typical channel for postponements in investment and hiring are "wait-and-see" real option effects (Bernanke, 1983; Dixit and Pindyck, 1994; Gilchrist et al., 2014; Alfaro et al., 2024) as these actions are costly to reverse and the value of waiting increases with uncertainty. For households, Romer (1990) argues for an exactly analogous channel for depressed spending on durable goods, where the irreversibility of these purchases increases the value of waiting with uncertainty—i.e., making a durables problem analytically the same as a lumpy firm investment problem. By comparison, a non-durables problem is better characterized by precautionary savings motives (Carroll, 1992), which apply broadly to all types of spending, regardless of lumpiness, and savings accounts used as buffer stocks. Eberly (1994) examines optimal (S,s) rules in automobile purchases and income uncertainty, Di Maggio et al. (2022) examine infrequent houses and cars,[4] while survey data on uncertainty perceived at the macro-level examine spending through either future plans to spend (Fermand et al., 2024) or self-reported recollections of money spent (Coibion et al., 2024). In contrast, we use daily data to examine novel savings responses, track actual spending transactions, and measure highly elusive household risks, linking these to exogenous employer-specific uncertainty shocks implied by options data akin to the VIX.

Our paper also contributes to the literature that connects income risk to employer-specific productivity shocks and highlights how firms can insulate workers from firm shocks that affect worker income streams. Guiso et al. (2005) find that workers are insured against permanent shocks to firm output but not against transitory shocks. Fagereng et al. (2017) use Norwegian population data to examine precautionary savings. Fagereng et al. (2018) analyze the effects of income risk on portfolio choices. Balke and Lamadon (2022) develop an equilibrium model where firms provide partial insurance against shocks to workers. We contribute by linking households to listed U.S. firms, using bank records to measure daily spending and savings behavior, and mapping firm uncertainty to monthly household risks that are critical to precautionary savings motives, revealing curved uncertainty responses and allowing us to quantify both the transmission of risks and households' ability to self-insulate their consumption from firm uncertainty effects.

The paper proceeds as follows: Section 2 discusses data and methodology; Section 3 firm and household responses; Section 4 risk transmissions and smoothing; Section 5 concludes.

2. Data and empirical methodology

2.1. Household data

Our analysis uses anonymized household data from an online account aggregator that allows for the management of household finances from a centralized platform. The raw data contain daily bank and credit card transactions for approximately 2.7 million households from June 2010 to May 2015. Comparable administrative data have been employed in recent studies (Agarwal and Qian, 2014; Baugh et al., 2018; Baker, 2018; Olafsson and Pagel, 2018; Ganong and Noel, 2019), and Baugh et al. (2021), with Baker (2018) providing an extensive validation of similar account aggregator data against external sources.

The household data include income deposits from employers, which we link to listed employers using a fuzzy matching algorithm with company names in the Compustat-Center for Research in Security Prices (CRSP) dataset. We identify 92,259 households linked to 2169 publicly traded firms, covering 61% of all 3550 listed firms in the sample period with the required return and volatility data. We further require households to have income and spending data and reside in the U.S. Total spending in our data includes typical spending on durables and non-durables across multiple categories as classified by the data provider and by using keyword searches on transaction descriptions. We examine economically active households with income relationships of at least $500 in average monthly income. Our final sample has a large distribution of 56,874 households linked to 870 publicly traded employers.

Table 1 presents key information on the final sample compared to external benchmarks. Sample households have a median monthly income of $5830, which is 124% of the U.S. median household income of $4710.[5] Panel A of Fig. 3 compares the annual income distribution of our final matched sample (right) and the broad unmatched sample (left) with U.S. Census data.[6] Households in our final sample vary widely in income levels and largely resemble the positively skewed frequency patterns seen in the U.S. Census income distribution. We observe relatively more high-income households because our sample requires employment at publicly listed firms. Income differences also occur because we measure post-tax income net of benefits like 401(k) contributions and healthcare premiums.

Panel B of Fig. 3 presents the distribution of listed employers in our final sample by annual firm characteristics, including option-implied

[4] Our early work in Alfaro and Park (2019) that precedes Di Maggio et al. (2022) identifies first evidence in the literature of idiosyncratic detrimental effects of employer stock return volatility of U.S. listed firms on households.

[5] U.S. Census Bureau 2015 Median Household Income (variable MEHOINUSA646N) from FRED.

[6] 2013 U.S. Census Current Population Survey (HINC01).

Table 1
Representativeness: Sample data compared to external benchmarks. This table compares key statistics of our final sample to external benchmarks. Total spending and spending on non-durables and durables represent mean monthly spending values for households in our sample compared against the monthly spending benchmark from households in the 2015 Consumer Expenditure Survey. Income is median monthly income for households in our final sample and the benchmark is the 2015 median monthly household income from the US Census Bureau. Similarly, bank balances benchmark is from the Survey of Consumer Finances, median statistics. The benchmark for number of households is the approximate 7000 households surveyed in both the Interview and Diary surveys from the Consumer Expenditure Survey. Firms in the US stock market compares the number of firms in our final sample against the number of listed firms with required data in the 2010 to 2015 period. Firm constituents of S&P 500 compares the number of employers in our sample appearing as constituents of the S&P 500 Index and VIX from 2010 to 2015. US states and counties include all contiguous and noncontiguous state territories.

	Sample (1)	Benchmark (2)	Ratio (%) = (1)/(2) (3)	Benchmark source (4)
Total spending	$2915	$3185	92	Consumer Expenditure Survey
Non-durables	$2252	$1839	122	Consumer Expenditure Survey
Durables	$663	$1345	49	Consumer Expenditure Survey
Bank balances	$6972	$4100	170	Survey of Consumer Finances
Income	$5830	$4710	124	US Census Bureau
Households	56,874	7000	812	Consumer Expenditure Survey
US states	49	50	98	US Census Bureau
US counties	669	3142	21	US Census Bureau
Firms in US stock market	870	3550	25	Compustat-CRSP
S&P 500 constituents	160	589	27	CRSP S&P 500 constituents

volatility from OptionMetrics, returns, employee count, and investment rates, alongside analogous distributions for all firms in the Compustat-CRSP universe for comparison, showing good coverage. Additional employer distributions by other firm characteristics are presented in the Online Appendix Figure A.1. For brevity, firm data details are in Data Appendix A.1. Table 1 shows our final sample includes 160 S&P 500 constituents (27% of all 589 S&P firms). Geographically, households seem well spread, spanning 49 states (98% coverage) and 669 counties (21% of all 3142 U.S. counties).

Table 1 also compares our spending data to external benchmarks. Mean household spending is $2915 per month, representing 92% of the $3185 reported in the U.S. Consumer Expenditure (CE) Survey. Breaking this down, sample households spend an average of $2252 on non-durables (122% of CE Survey's $1839) and $663 on durables (49% of CE Survey). Median household bank account balances are $6972 (170% of the Survey of Consumer Finances, $4100). While our data provide good coverage, non-durable spending is more accurate than durables, a common pattern in transaction-level datasets (e.g., Ganong and Noel (2019)), as non-durables are typically paid for using credit and debit cards.

2.2. Household spending, regression specification

Our main regression specification examines whether increases in forward-looking firm uncertainty predict future adjustments in spending of households employed by those firms. We measure all required variables at the monthly frequency. The specification is as follows:

$$\begin{aligned}\Delta\text{Spending}_{i,t} &= \beta_0 + \beta_1 \cdot \Delta\text{Volatility}_{j,i,t-3} \\ &+ \beta_2 \cdot \text{Return}_{j,i,t-3} + \beta_3 \cdot \Delta\text{Income}_{i,t} \\ &+ \beta_4 \cdot \ln(\text{Zillow Home Price Index})_{c,i,t} \\ &+ \alpha_i + \gamma_j + \delta_t + \epsilon_{i,t} \end{aligned} \quad (1)$$

This regression examines how employer uncertainty shocks forecast 3-month-ahead changes in household spending. $\Delta\text{Spending}_{i,t}$ represents the growth in average monthly spending for household i, calculated by averaging monthly spending over a 3-month period and measuring growth into the subsequent 3 months. We also present extensions with shorter and longer windows to assess both the immediacy and persistence of household responses.

For each household's employer j, firm uncertainty shocks, $\Delta\text{Volatility}_{j,i,t-3}$, measure 3-month growth rates in forward-looking option-implied volatility from OptionMetrics. Similar to the VIX, we measure firm volatility monthly using a two-sided mix of puts and calls, averaging daily 365-day-forward at-the-money (ATM) implied volatility. To disentangle second-moment effects from correlated first-moment return effects, $\text{Return}_{j,i,t-3}$ controls for firm stock returns, with both variables lagged by 3-months to anticipate spending changes.

$\Delta\text{Income}_{i,t}$ is the 3-month change in average monthly income measured contemporaneously with $\Delta\text{Spending}_{i,t}$. To account for geographic cost-of-living differences, we include a monthly county-level c home price index from Zillow (in logs) for each household. This variable controls for local economic shocks and housing wealth effects that have been of concern since the housing market downturn of the financial crisis of 2008–09. α_i, γ_j, and δ_t are household, employer, and time (monthly) fixed effects, respectively. Standard errors are clustered at the firm level. Appendix Table A.1 presents summary statistics for all key variables, with reasonably well-behaved (bell-shaped) distributions shown in Appendix Figure A.2.

Changes are growth rates following Davis and Haltiwanger (1992), calculated as $\Delta x_t = (x_t - x_{t-1})/(\frac{1}{2}x_t + \frac{1}{2}x_{t-1})$. This measure approximates log changes up to a second-order Taylor series expansion but is preferred (Davis et al., 2007) for aggregated data such as dollar flows because it is symmetric and bounded between −2 and 2 (i.e., $\leq|200\%|$) for positive x values. Variables are winsorized at percentiles 1 and 99.

3. The response of households and firms to firm uncertainty

3.1. Uncertainty and firm dynamics

To motivate the response of households to employer uncertainty, we first show that firm volatility strongly predicts important firm dynamics using a standard Compustat firm panel. For consistency with our household forecasts, firm regressions relate changes in firm outcomes to one-year lagged changes in firm uncertainty, with the lag accounting for time-to-build delays and to reduce contemporaneous confounding. Included are firm and time fixed effects and standard controls: stock returns and Tobin's Q (controlling for first-moment effects), tangibility, leverage, return on assets, size, and a dependent variable lag for persistence.[7]

Column (1) of Table 2 Panel A examines firm investment, with a highly significant point estimate of −0.032 (t-stat = 9.03), indicating that a doubling of firm-level volatility leads to a 3.2 average percentage point decline in annual investment as a fraction of firms' capital stock. Panel B shows that a two-standard-deviation increase

[7] For brevity, data and variable details are discussed in Appendix Section A.1, following standard definitions in Alfaro et al. (2024), Peters and Taylor (2017), and Leary and Roberts (2014).

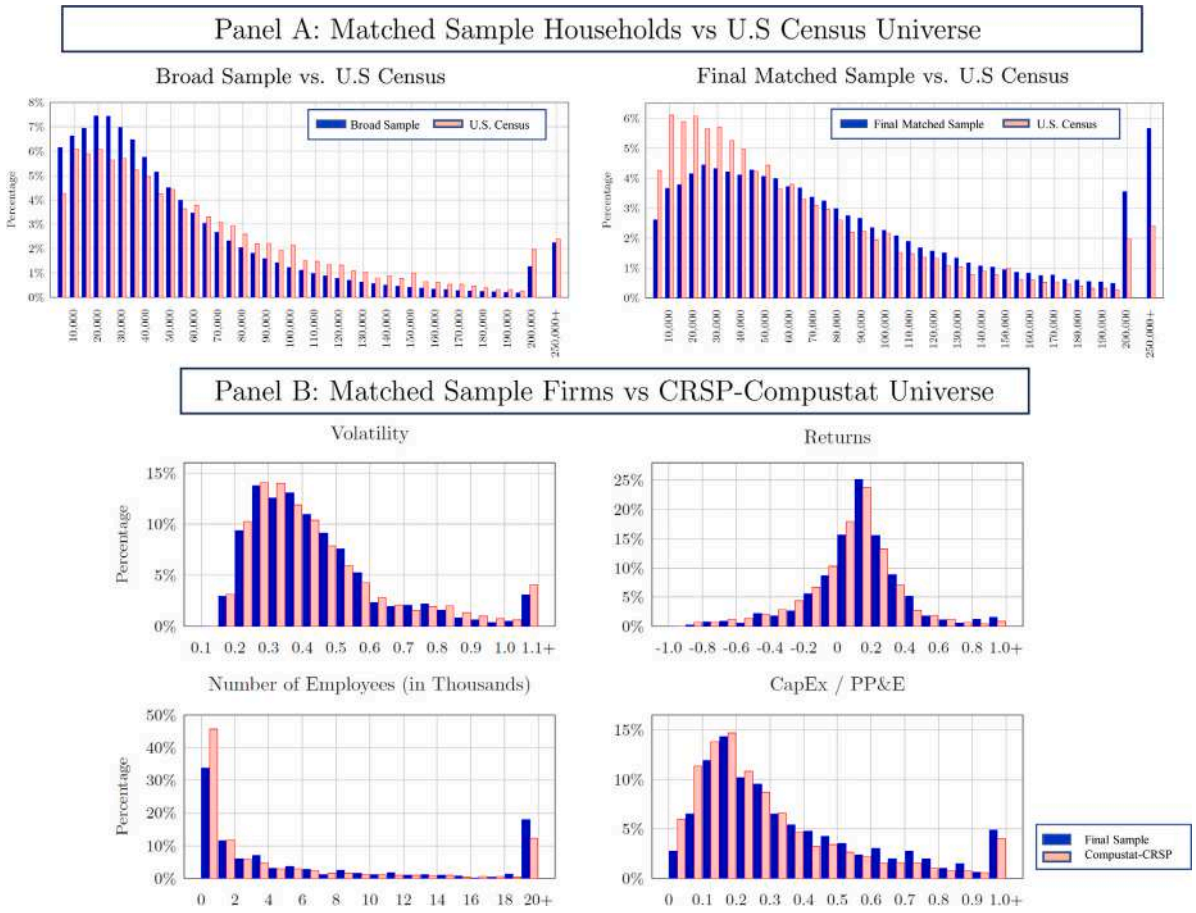

Fig. 3. Representativeness: Distributions of household income and of firm characteristics.
Notes: Panel A presents the distribution of annual incomes for households in the final sample (right, blue) and all households from the larger unmatched sample (left, blue), alongside the annual income distribution from the 2011 U.S. Census (red). Panel B presents the distribution of listed firms in our final sample (blue) and of all listed firms with required data in the Compustat-CRSP merged dataset (red) for the following annual firm characteristics: 365-day-forward option-implied volatility from OptionMetrics (top-left), 12-month compounded stock returns from CRSP (top-right), number of employees (bottom-left), and investment rate (CAPX divided by 1-year lagged net property, plant, and equipment PPENT) (bottom-right).

in firm volatility precedes a 1.4 point drop in investment rate. These effects are economically meaningful relative to aggregate shifts during recessions—for example, quarterly investment declined by 0.65 points during the 2008–2009 financial crisis, which saw threefold spikes in the S&P 500 VIX (Fig. 1).

Firms reduce investment not only in physical assets but also in other production inputs. Column (2) shows that one-year-ahead employment growth declines by 2.7 percentage points following a doubling in firm uncertainty—confirming in micro data the negative correlation between employment and the VIX seen in Fig. 1. Column (3) indicates that firms cut intangible investment at a higher rate than tangible assets, with Panel B showing −0.126 vs. −0.077 declines in these investment rates for a two-standard-deviation increase in firm volatility, suggesting strong cuts to R&D and intellectual property funding during uncertainty.

In stark contrast, column (4) shows that firms increase cash holdings, indicating the adoption of precautionary savings strategies. Option-implied uncertainty, measurable in real-time, also anticipates shifts one-year-ahead in other key firm metrics that directly affect employees: reductions in SG&A expenses (which partly include wages), sales (affecting performance bonuses), and payouts (including dividends), as seen in columns (5) to (7).

Appendix Table A.2 tests robustness by replacing forward volatility with realized volatility. While directionally consistent, these backward-looking measures show notably smaller effects and significance. For example, in comparable standard deviation responses (Panel B), the drops in firm investment in physical and intangibles are 1.62 and 2.46 times larger, while effects on employment and SG&A are 1.5 and 2.85 times larger, respectively—supporting our preference for implied volatility, analogous to the VIX, for analyzing households next.

3.2. Firm uncertainty and household spending: Evidence from transactions

Table 3 presents the main results that run specification (1). The use of growth rates in both the left-hand-side spending and right-hand-side income variables 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).[8] Analogously, the coefficients on firm volatility growth, β_1, and stock returns (implicitly the growth in firm stock prices), β_2, can be interpreted as elasticities of spending with respect to employer volatility and stock prices, respectively, and allow us to distinguish between second- and first-moment effects.[9]

[8] See also Baker (2018) and Ganong et al. (2020) for same interpretation.

[9] Firms' implied volatility maps one-to-one to the price of the option. Practitioners often monitor implied volatility directly instead of invoice price, making β_1 interpretable as spending elasticity with respect to dollar price of firms' vol. (2nd-mom.), comparable to that with respect to stock price, β_2, (1st-mom.).

Table 2
Forward-looking firm uncertainty shocks and 1-year ahead corporate investment, employment, savings, and other firm outcomes, 1996–2023. Panel A in this table presents firm-level j annual regression results for 7 different employer variables predicted by and regressed on 1-year lagged changes in firm annual 365-day-forward option-implied volatility from OptionMetrics. Dependent variables include firm annual investment rates ($I_{j,t}/K_{j,t-1}$), and the annual changes in employment, intangible investment, cash, selling general & administrative expense, sales, and corporate payout. Data sample are from January 1996 to December 2023. Firm uncertainty shocks, $\Delta\sigma_{j,t}$, are defined as the annual growth rate in 365-day-forward option-implied volatility from OptionMetrics. These volatilities, $\sigma_{j,t}$, are computed as the 365-day average of firms' daily option-implied volatility, where the daily observations are the simple average of 365-day-forward at-the-money (ATM) call and put options. To ease comparison of the effects across columns, Panel B reports the response of each dependent variable to a two standard deviation volatility shock. Firm-level controls include the stock return of the firm $r_{j,t-1}$ (measured as firms' 12-month-compounded return from CRSP) and Tobin's $Q_{j,t-1}$ which accounts for investment opportunities. These variables control for correlated first-moment effects. Additional controls include a set of standard financial controls following Alfaro et al. (2024) and Leary and Roberts (2014), including Tangibility$_{j,t-1}$, Book Leverage$_{j,t-1}$, Return on Assets$_{j,t-1}$, and Firm Size$_{j,t-1}$. A lag in the dependent variables control for their potential autocorrelation. Variables are winsorized at the 1 and 99 percentiles. Firm and year fixed effects are included. Standard errors are clustered at the firm level, reported in parentheses. Additional details on variable definitions and data sources are in the Appendix. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	$I_{j,t}/K_{j,t-1}$	ΔEmp$_{j,t}$	ΔIntang Inv$_{j,t}$	ΔCash$_{j,t}$	ΔSG&A$_{j,t}$	ΔSales$_{j,t}$	ΔPayout$_{j,t}$
A: Firm regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔVolatility$_{j,t-1}$	−0.032***	−0.027***	−0.060***	0.085***	−0.056***	−0.047***	−0.290***
	(0.004)	(0.005)	(0.006)	(0.016)	(0.006)	(0.008)	(0.026)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,737	53,310	53,310	53,304	44,523	53,310	53,310
R^2	0.611	0.286	0.276	0.167	0.266	0.326	0.176
B: Effect of a 2 Std. Dev. volatility shock (of size 0.452)							
Magnitude of effect	−0.014	−0.012	−0.027	0.038	−0.025	−0.021	−0.131
Response in Std Dev units	−0.077	−0.059	−0.126	0.064	−0.117	−0.077	−0.138

Table 3
Forward-looking firm uncertainty shocks and future household spending. This table presents regression results that forecast 3-month-ahead changes in average monthly household spending from employer-level volatility shocks (as implied by forward-looking options data). Regression specification is in Eq. (1), with details in Section 2.2. Frequency of all variables is monthly. Spending includes purchases of durable goods, non-durable goods, and services. ΔSpending$_{i,t}$ is the 3-month growth in average monthly spending at the household i level. For each household, we measure spending every month over a 3-month period, obtain the average monthly spending over this span, and construct the growth into the next 3 months. Similar to the firm uncertainty shock measures of Table 2 but using 3-month growth rates instead of 12-month, employer j volatility shocks, $\Delta\sigma_{j,i,t-3}$, are defined as the 3-month growth rate in 365-day-forward firm volatility data from OptionMetrics, using ATM call and put options. Firm returns are 3-month compounded stock returns, 3M Return$_{j,i,t-3}$, from CRSP. Both employer volatility shocks and returns are lagged by 3-months to anticipate changes in household spending. Household income shocks control for income effects that affect the budget constraint of households at the time of spending, where ΔIncome$_{i,t}$ is the 3-month change in average monthly income measured analogously to and contemporaneously with changes in spending, ΔSpending$_{i,t}$. To account for housing wealth effects and for differences in the cost of living across households spread across the US, specifications control for a monthly home price index from Zillow (in log) measured at households' county level c. Column (4) presents the results of placebo falsification tests that replace true household sample employers with placebo employers. The average coefficients and standard errors from 100 placebo regressions based on random matches are presented. Column (5) replaces the monthly fixed effects in regression (1) in column (3) with county-by-month-year fixed effects and drops the monthly county Zillow index to avoid perfect collinearity. Variables are winsorized at the 1 and 99 percentiles. Standard errors are clustered at employer level, reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

ΔSpending$_{i,t}$	(1)	(2)	Baseline (3)	Placebo (4)	County-time FE (5)
ΔVolatility$_{j,i,t-3}$	−0.094***	−0.084***	−0.100***	−0.005	−0.074***
	(0.025)	(0.024)	(0.025)	(0.023)	(0.018)
3M Return$_{j,i,t-3}$		0.015**	0.017***	0.000	0.016***
		(0.007)	(0.006)	(0.006)	(0.006)
ΔIncome$_{i,t}$			0.117***	0.117***	0.116***
			(0.008)	(0.008)	(0.008)
Home price index	Yes	Yes	Yes	Yes	No
Firm FE	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes	No
County-month-year FE	No	No	No	No	Yes
Observations	2,131,711	2,131,711	2,131,711	2,131,711	2,123,003
R^2	0.082	0.082	0.088	0.088	0.100

Columns (1) and (2) show nested models, while column (3) presents the full baseline results. Firm uncertainty consistently shows negative effects on future household spending, reflecting exogenous detrimental effects and suggesting risk-averse U.S. workers. Stock returns show positive effects, implying increased spending after higher firm stock prices—likely reflecting workers anticipating performance bonuses when firm values rise.

Baseline column (3) further controls for the effect of changes in income that directly affect the budget constraints of households at time of spending. We find a coefficient on income shocks of 0.117, which means that a 10 percent increase in income is associated with an increase of 1.17 percent in household spending. This elasticity is comparable to recent estimates using similar high-frequency administrative data. For example, Ganong et al. (2020) estimate an ordinary least squares coefficient remarkably close to ours at 0.12.[10] This reassuring similarity in monthly spending elasticities validates our data as largely comparable to external sources (e.g., Ganong and Noel (2019)) and allows us to control for income effects (β_3) while focusing on novel uncertainty estimates (β_1).

After controlling for household income shocks, firm returns, and housing wealth, column (3) reports an elasticity coefficient of −0.10 on firm uncertainty shocks. This means that a doubling in firm implied

[10] Income elasticities of consumption vary with aggregation level (higher at state/country level) and frequency (higher at annual vs. monthly). Examples: Baker (2018) finds quarterly elasticities of 0.295; Brueckner et al. (2012) government elasticities of 0.03–0.6; Havranek and Kokes (2015) gasoline elasticities of 0.1–0.23; Baker and Yannelis (2017) elasticities of 0.302 from the 2013 government shutdown.

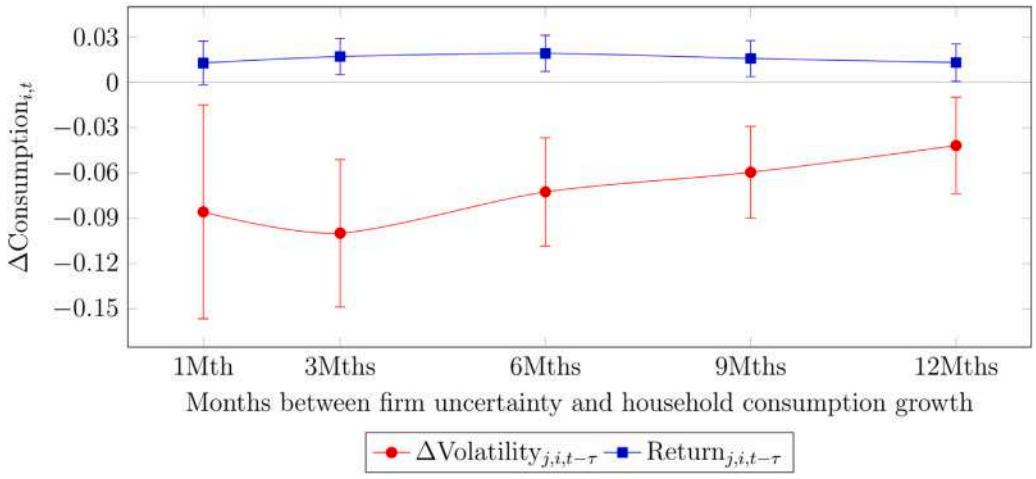

Fig. 4. The household spending response to listed firms' uncertainty shocks and stock returns: spending forecasts up to 1-year ahead.
Notes: This figure presents regression estimates of 1-through 12-month-ahead changes in average total monthly household spending as predicted by the baseline regression in Eq. (1) at different forecast horizons. The point estimates at the 3-month horizon are derived from the spending baseline regression results presented in Table 3, column 3, with controls. Red dots represent coefficients on employers' option-implied volatility shocks, and blue squares coefficients on employers' stock returns. Point estimates are displayed for each forecasting horizon window, with 95% confidence intervals shown as vertical lines. The estimates reflect the forecasted percent change (y-axis) in household average monthly spending over the n subsequent months (x-axis windows) following shocks to firm volatility and stock prices.

volatility causes a 10% decline in average monthly household spending over the next quarter. In economic terms, with mean monthly spending of $2915 (Table 1), this represents a monthly reduction of $291.50, or a cumulative drop of $875 over the quarter—equivalent to foregoing the purchase of a new iPhone (average price $873 in sample years) in the next quarter. In more modest terms, a standard deviation increase in firm volatility (size 0.12) depresses monthly spending by $106, or $318 quarterly. With the 2015 median hourly U.S. wage of $13.44, this $106 reduction represents roughly 8 h' worth of wages per month, equivalent to roughly 40% of a typical monthly budget for entertainment at $265 (U.S. CE Survey), hence an economically meaningful impact on consumer behavior.

To verify that the strong micro-level response of spending is truly driven by the idiosyncratic link between households and their employers, columns (4) and (5) rule out alternative explanations. Column (4) presents the average results from 100 placebo falsification tests where true employers are replaced with random placebo employers—for example, little reason why an average Microsoft employee would adjust behavior to shifts in firm uncertainty of unrelated listed companies like Abercrombie & Fitch or Chipotle Mexican Grill. We find no spending response to placebo employer uncertainty and returns. Column (5) replaces monthly fixed effects with county-by-month fixed effects to control for local economic conditions, confirming these shocks do not explain our idiosyncratic household results.

Appendix Table A.3 presents a battery of robustness tests that vary our preferred specification from Table 3, Column (3). Results hold when reducing or eliminating overlapping information and when measuring uncertainty contemporaneously with spending. Notably, when using realized volatility (columns 9–10), the spending response is four times smaller than with preferred forward-looking data. Appendix Tables A.4 and A.5 address concerns that industry or aggregate uncertainty might drive our results by conducting horse races between firm-, industry-, and aggregate-level uncertainty, confirming findings are unique to the idiosyncratic firm-to-households propagation, with detailed discussion in the Appendix.

3.3. Persistence of spending adjustments and comparison with return effects

We run variations of baseline regression equation (1), varying the windows used for constructing variables and growth rates, to examine both the immediacy and persistence of spending responses. Fig. 4 presents point estimates and 95% confidence intervals for firm uncertainty shocks and returns. First, results show a strong precautionary savings motive, with reductions in spending persisting up to four quarters following increases in idiosyncratic employer volatility. This persistence is notable because it compares to that of aggregate uncertainty effects—e.g., Basu and Bundick (2017) find persistent declines in aggregate consumption lasting roughly five quarters after uncertainty shocks measured via the S&P 500 VIX, yet our micro-driven firm effects are not explained by aggregate VIX shifts.

Second, households respond more intensely to firm uncertainty than to firm returns. While higher employer valuation lead to higher spending—e.g., good news for bonuses and other compensation benefits, this effect is substantially smaller in magnitude and significance than that of heightened firm uncertainty. Using our baseline 3-month horizon with standardized coefficients, a one standard deviation uncertainty increase has 1.82 times the effect of a comparable standard deviation firm returns movement, with greater significance (t-statistics of −4.01 vs. 2.76). Third, while positive firm returns only offset about half of the negative uncertainty effects, poor firm returns can crucially combine to exacerbate the damaging effects of firm uncertainty—e.g., in turbulent times, crashing firm prices with simultaneous jumps in forward firm volatility can jointly cause large adverse effects on households.

3.4. Precautionary savings and detailed spending categories

3.4.1. The response of household precautionary savings

With precautionary savings motives, households adjust spending to increase savings. Table 4 Panel A presents savings responses from regression (1) for: bank interest received, bank balances, and transfers to major U.S. brokers—e.g., Vanguard, Fidelity, Charles Schwab.

Precautionary savings rise after employer uncertainty increases, particularly in liquid forms. A 10% increase in firm uncertainty leads to 1.01% and 0.76% increases in average monthly bank interest received and bank balances over the next quarter (significant at the 10% level). Appendix Figure A.3 shows different forecasting horizons: bank balance responses peak at 6 months (significant at the 10% level), while bank interest—highest at baseline 3 months—shows persistent responses at 6 and 9 months (significant at the 5% and 10% levels). Deposits into brokerage accounts peak at 6 months (significant at the 10%).

These micro patterns resemble the positive savings-uncertainty correlations seen in aggregates shown in Fig. 2, yet offer novel insights.

Table 4
The response of household precautionary savings and spending by major and granular categories. This table presents the regression results that forecast 3-month-ahead changes in various savings and consumption categories. Specification is similar to Eq. (1), but varies the dependent variable. Panel A shows the coefficients for the response in personal savings, which include interest received from bank balances, bank balances, and outflows from own accounts into brokerage accounts, and three major spending categories broadly defined by the Personal Consumption Expenditures (PCE) of the BEA: non-durables, services, and durables. Panel B shows the response in granular spending categories, which include groceries, restaurants, travel, entertainment, telecommunications, insurance, medical, clothing, and electronics. Variables are winsorized at the 1 and 99 percentiles. Controls are all included, as well as firm, household, and month-year fixed effects. Standard errors are clustered at the firm level, reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Precautionary savings and major spending categories

	$Savings_{i,t}$			$Major\ spending\ Categories_{i,t}$		
	ΔBank interest	ΔBank balances	ΔBrokerage deposits	ΔNon-durables	ΔServices	ΔDurables
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Volatility_{j,i,t-3}$	0.101*	0.076*	0.022	−0.059***	−0.033*	−0.099**
	(0.057)	(0.044)	(0.014)	(0.018)	(0.018)	(0.047)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,697,182	1,790,719	917,521	2,133,680	2,099,906	1,449,908
R^2	0.096	0.095	0.027	0.076	0.069	0.042

Panel B: Granular spending $Categories_{i,t}$

	ΔGroceries	ΔRest-aurants	ΔTravel	ΔEnter-tainment	ΔTelecom-munications	ΔInsurance	ΔMedical	ΔClothing	ΔElec-tronics
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\Delta Volatility_{j,i,t-3}$	0.013	−0.049**	−0.102***	−0.087***	−0.054***	−0.003	0.014	−0.040	−0.090*
	(0.028)	(0.024)	(0.035)	(0.030)	(0.019)	(0.019)	(0.028)	(0.031)	(0.047)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,606,547	1,610,755	1,038,334	1,197,935	1,368,589	1,070,077	1,169,098	1,189,547	725,561
R^2	0.066	0.056	0.048	0.042	0.054	0.051	0.044	0.055	0.075

First, the liquid savings results are economically meaningful: a one standard deviation increase in firm volatility predicts a cash buildup of $193 in monthly balances—roughly 14 h of wages per month, in the next quarter. These increased savings at banks offset the decrease in baseline spending documented in Section 3.2. Second, liquid savings responses are larger than brokerage deposits, likely reflecting a preference for liquid assets due to easier accessibility for consumption smoothing, whereas withdrawals from brokerage funds may entail delays and transaction costs.

3.4.2. *The spending response by consumption categories*

While our main results establish that firm uncertainty significantly impacts overall household spending, the magnitude of this response likely varies with purchase characteristics such as durability and discretion. Decomposing spending allows us to distinguish between "wait-and-see" behavior associated with real options theory, which primarily predicts deferments of lumpy durable purchases for which households may have wide inaction regions, and broader precautionary savings motives that affect adjustments in spending across all types.

We start by breaking down total spending into major classifications, broadly based on the Personal Consumption Expenditures (PCE): non-durables, services, and durables. Spending on durable goods captures purchases related to electronics, home furnishings, improvements, maintenance, and automobile parts and repairs, which are excluded from non-durable and services expenditures.[11] The results are presented in Table 4 Panel A, columns (4) to (6) for baseline 3-month spending forecasts. Consistent with precautionary motives and wait-and-see effects, durables show pronounced negative responses. However, non-durables and services spending also drop following increased employer uncertainty (significant at 1% and 10%), indicating strong curvature in the utility of households in response to uncertainty.

Panel B of Table 4 explores more granular responses across nine categories, with Appendix Figure A.4 showing coefficients for horizons up to 12 months. At the baseline 3-month horizon, we find negative and statistically significant responses in 5 categories: restaurants, entertainment (e.g., movies), telecommunication (e.g., phone and cable services), travel, and electronics. These categories include typical daily purchases, beyond just large, infrequent expenditures, further evidencing strong precautionary motives.

The granular analysis reveals additional notable insights: First, households seem to engage in selective substitution—expenditures on restaurants decline while grocery spending shows a positive sign, which becomes comparable in magnitude at longer horizons and is statistically significant at its peak 9 months. This pattern suggests households shift behavior toward less expensive alternatives, consistent with findings in Romer (1990) of increased food spending amid falling durable consumption after the large uncertainty of the 1929 stock market crash. Second, cuts are sharper in highly discretionary categories (travel, electronics) versus less-discretionary expenditures (insurance, medical), which remain largely unaffected—likely reflecting a reluctance to adjust these health-related, less-discretionary expenses. Third, other categories are also affected by uncertainty depending on the horizon—such as clothing and apparel with significant immediate reductions at a 1-month horizon—but standard errors can be quite large depending on the category-horizon case.

Collectively, these analyses show cautious household adjustments in both spending and savings behavior. The next section addresses the question of why we observe these responses, by showing how firm uncertainty maps onto increased household risks.

4. Firm uncertainty and higher-order household moments

Our findings thus far highlight how impulses in employer-level volatility anticipate key micro-level outcomes on the sides of both supply and demand. In this section, we examine how these uncertainty shocks affect households through two channels: first, their impact on

[11] For similar classifications by category, see for example, Lusardi (1996) and Ganong and Noel (2019).

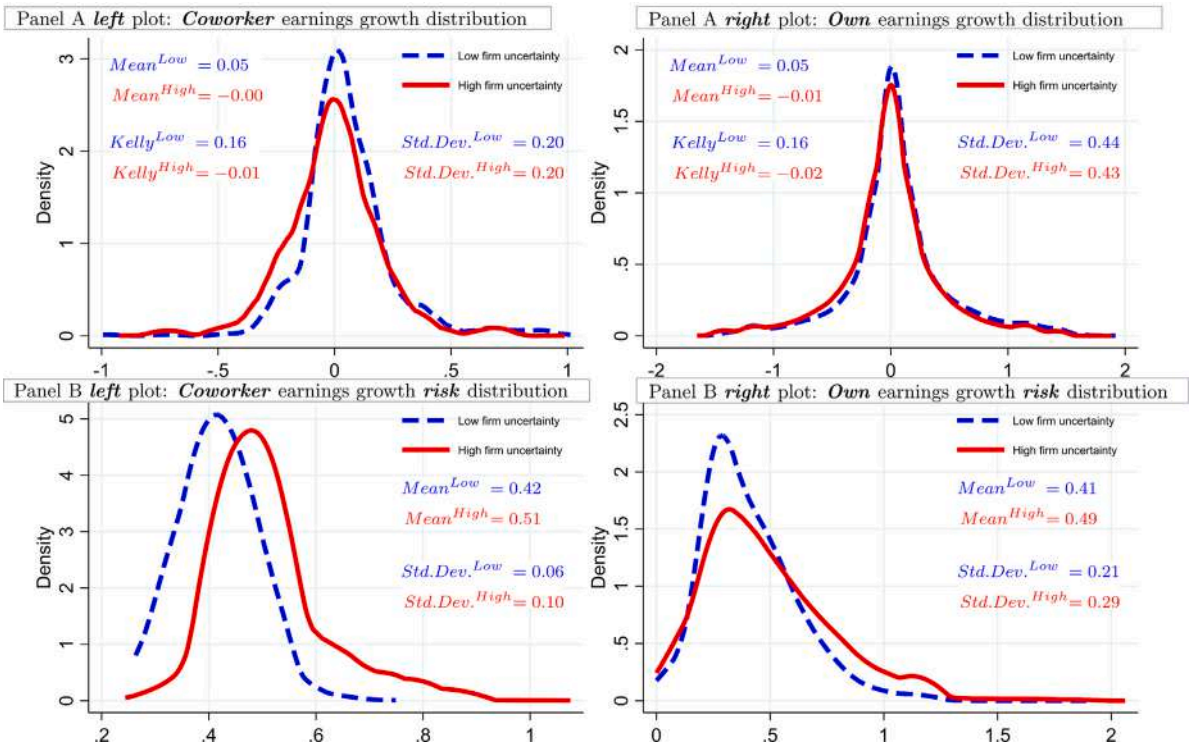

Fig. 5. The future dynamics of employee earnings growth and its volatility in response to firm uncertainty. Panel A: Distribution of growth in 3-month average earnings across high & low preceding firm uncertainty shock quintiles. Panel B: Distribution of 12-month volatility in monthly earnings growth across high & low preceding firm uncertainty quintiles.

Notes: Panel A shows the empirical densities of growth in 3-month average earnings (computed as the change in 3-month average monthly earnings from t + 1 to t + 3) conditional on preceding 3-month firm volatility shock quintiles (high and low) at time t. Left panel shows coworker averages; right panel shows individual employee outcomes. Panel B shows the empirical densities of earnings growth volatility, measured as the 12-month standard deviation of monthly earnings growth over months t + 1 to t + 12, conditional on preceding 12-month firm volatility quintiles (high & low) at t. Reported statistics include mean, std. dev., and Kelley skewness of the distributions. Coworker analysis includes listed firms with 50 employees (166 firms; results robust to 25 or 10 employee thresholds, covering 275 and 486 firms respectively). Distributions are weighted by prior-year firm size (market equity).

the distributions of future worker earnings and consumption growth, and second, their effects on the distributions of novel worker-level measures of earnings and consumption growth risks.

Methodologically, to examine the propagation of firm uncertainty onto household risks, we perform distributional analysis on both earnings and consumption dynamics by splitting future employee distributions across high and low firm uncertainty groups. As argued in Guvenen et al. (2014), distributional approaches are convenient in large samples like ours as they minimize parametric assumptions (which imposed may easily obscure non-linearities) and have the added benefit of presenting results in figures and easy-to-interpret statistics.

4.1. Firm uncertainty and income growth dynamics

Fig. 5 provides our first application of the distributional approach. Given the close correlation between an employee's earnings growth and that of their coworkers within the firm,[12] Panel A presents both coworker (top left) and individual (top right) earnings growth distributions. Specifically, using the same baseline growth rate in average monthly earnings over 3-month windows from earlier sections, the top left of Panel A presents the distribution of average coworker earnings growth—measured from $t+1$ to $t+3$ using the mean growth across all peer $\{-i\}$ employees in firms with 50 or more workers—conditional on predated high versus low quintiles of firm volatility shocks measured at t.[13] The top right of Panel A presents analogous distributions for employees' own earnings growth, which are free of coworker data requirements. Further, for each conditional distribution, the panels report means, standard deviations, and as is typical for third moments in earnings dynamics, the Kelley (1947) skewness, a measure of skewness that is robust to outliers.[14]

The distributions show several key patterns. First, the first moment of earnings growth is lower for employees working at firms that have recently observed relatively high increases in uncertainty. This mapping from firm second moments onto household first moments of earnings growth holds for both the coworker and individual earnings growth distributions, which, in the latter case, shows that the mean earnings growth over the subsequent 3-months is −0.01 (0.05) for high (low) shocks to firm volatility—a high-minus-low difference of −6% in average earnings growth over the quarter that is statistically significant at the 1% level.

Second, relative to workers with recent low firm uncertainty, the earnings growth distribution for employees at highly uncertain employers becomes relatively left-skewed (negative skewness). Panel A illustrates this through the asymmetric changes in the tails of the distributions. High firm uncertainty is accompanied by a relative expansion of the left tail of the earnings growth distribution, where employee earnings experience particularly poor future outcomes. Simultaneously,

[12] See Ganong et al. (2020) for evidence using JPMorgan Chase Bank data.

[13] For accuracy in peer averages, the coworker distributions require ≥50 employees for which we have 166 listed firms—with similar results using ≥25 or ≥10 thresholds, covering 275 and 486 firms respectively.

[14] Kelley skewness is the difference between the 90th-to −50th percentile differential (a measure of dispersion in the right tail) and the 50th-to-10th percentile differential (dispersion in the left tail) divided by the 90th-to-10th percentile differential (measuring total dispersion of the distribution). For a distribution with a compressed upper half and a dispersed lower half, Kelley skewness is negative (i.e., a left-skewed distribution).

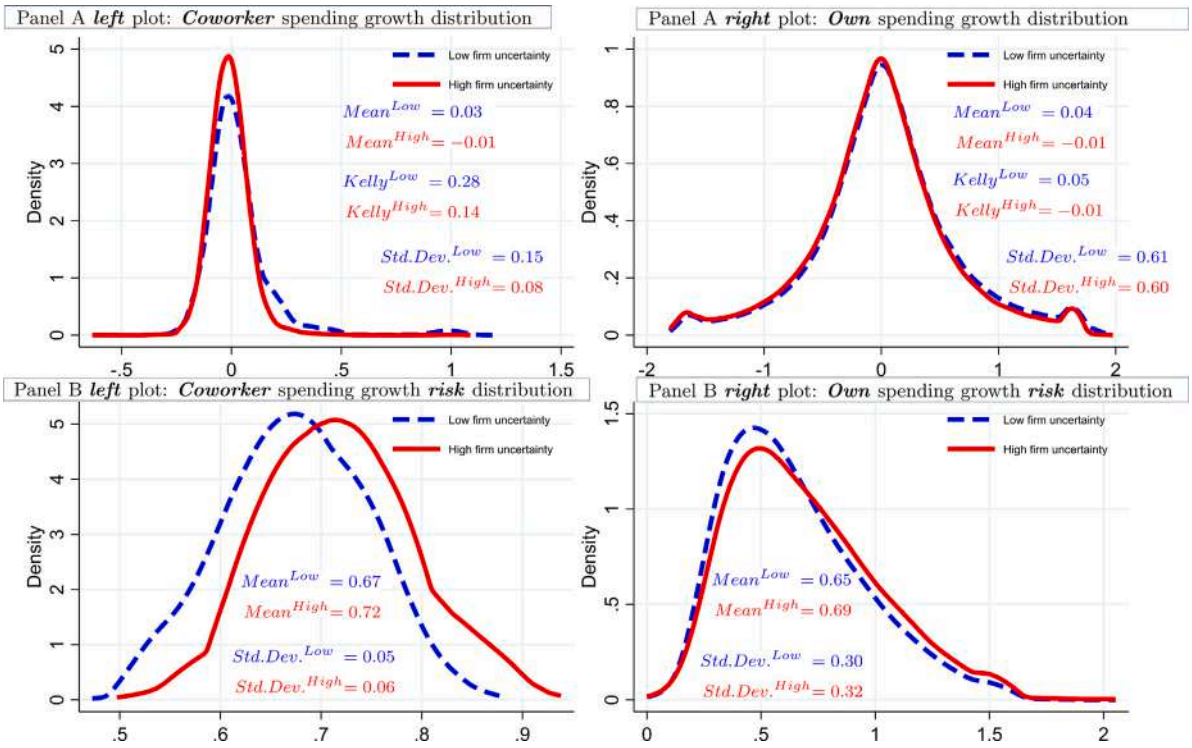

Fig. 6. The future dynamics of employee spending growth and its volatility in response to firm uncertainty. Panel A: Distribution of growth in 3-month average spending across high & low preceding firm uncertainty shock quintiles. Panel B: Distribution of 12-month volatility in monthly spending growth across high & low preceding firm uncertainty quintiles.

Notes: Panel A shows the empirical densities of growth in 3-month average spending (computed as the change in 3-month average monthly spending from t + 1 to t + 3) conditional on preceding 3-month firm volatility shock quintiles (high & low) at time t. Left panel shows coworker averages; right panel shows individual employee outcomes. Panel B shows the empirical densities of spending growth volatility, measured as the 12-month standard deviation of monthly spending growth over months t + 1 to t + 12, conditional on preceding 12-month firm volatility quintiles (high & low) at t. Reported statistics include the mean, std. dev., and Kelley skewness of the distributions. Coworker analysis includes listed firms with 50 employees (166 firms; results robust to 25 or 10 thresholds, covering 275 and 486 firms respectively). Distributions are weighted by prior-year firm size (market equity).

there is a relative contraction in the right tail, with workers experiencing more muted earnings growth rates compared to the gains of those working at firms with low volatility. These cross-sectional relative patterns are quantified by Kelley skewness measures, which for employees' own earnings growth distribution (top right Panel A) show a skewness of −0.02 for highly volatile firms and 0.16 for those with low uncertainty—a high-minus-low difference of −0.18 significant at the 1% level based on bootstrapped tests.

Third, the dispersion of employee earnings growth shows little change from low to high firm uncertainty, with almost identical standard deviations for the distributions of coworker (0.20) and own earnings (0.43 vs. 0.44)—neither difference being statistically significant. This might seem surprising, as one might expect measures of earnings shock dispersion to be strongly countercyclical. However, our findings using matched household-firm data align with substantial recent evidence documenting that the variance of worker earnings growth is largely acyclical over the business cycle, with small differences across recessions and expansions (Busch et al., 2022). Prominently, Guvenen et al. (2014) find that the ratio of U.S. recessions to expansions of the standard deviation of earnings shocks is 1.02—and mostly 1.00 when further conditioned across worker earnings levels. The ratio in our paper is close to 1 when splitting across high and low firm uncertainty fluctuations that largely associate with recession and expansionary phases, a finding that we find reassuring before turning next to examine volatilities of monthly income growth.

Lastly, these patterns in earnings shock dispersions provide novel evidence connecting the isolated (Bloom, 2009)-style firm uncertainty and Guvenen et al. (2014)-style household income literatures, showing how firm uncertainty generates stylized patterns in households.

To summarize, Panel A of Fig. 5 indicates that firm second moments, as implied by forward-option volatilities, map onto lower subsequent first and third moments of household earnings growth distributions, while leaving their second moments largely unchanged. This raises the question of whether income risk is truly unaffected by firm volatility. We address this next by examining monthly employee-level measures of income risk, which are better suited than the distributional dispersion measures above for capturing actual income risk, as they track each individual's earnings volatility over multiple quarters after firm shocks.

4.2. Are variances of worker-level earnings risk higher in firm uncertainty?

Panel B of Fig. 5 presents the conditional distributions of coworker (bottom left) and individual (bottom right) earnings growth volatility, where volatility is measured using 12-month standard deviations of monthly earnings growth over months $t + 1$ to $t + 12$, conditional on prior high and low quintiles of 12-month firm volatility measured at month t.[15]

First, both distributional means of income risk in Panel B indicate that upon higher uncertainty observed at the firm level, there is a subsequent expansion in worker earnings risk. Across low to high firm uncertainty, the mean of the distribution of coworker monthly income growth volatility increases from 0.42 to 0.51 over the next year, while from 0.41 to 0.49 for individual-level earnings risk—and in both cases their high minus low differentials are significant at the 1% level. The

[15] Using at least 12 months for earnings volatilities seems prudent given noise at shorter spans, and coincides with the 1-year ahead predictabilities of employment growth. Results are similar using longer windows.

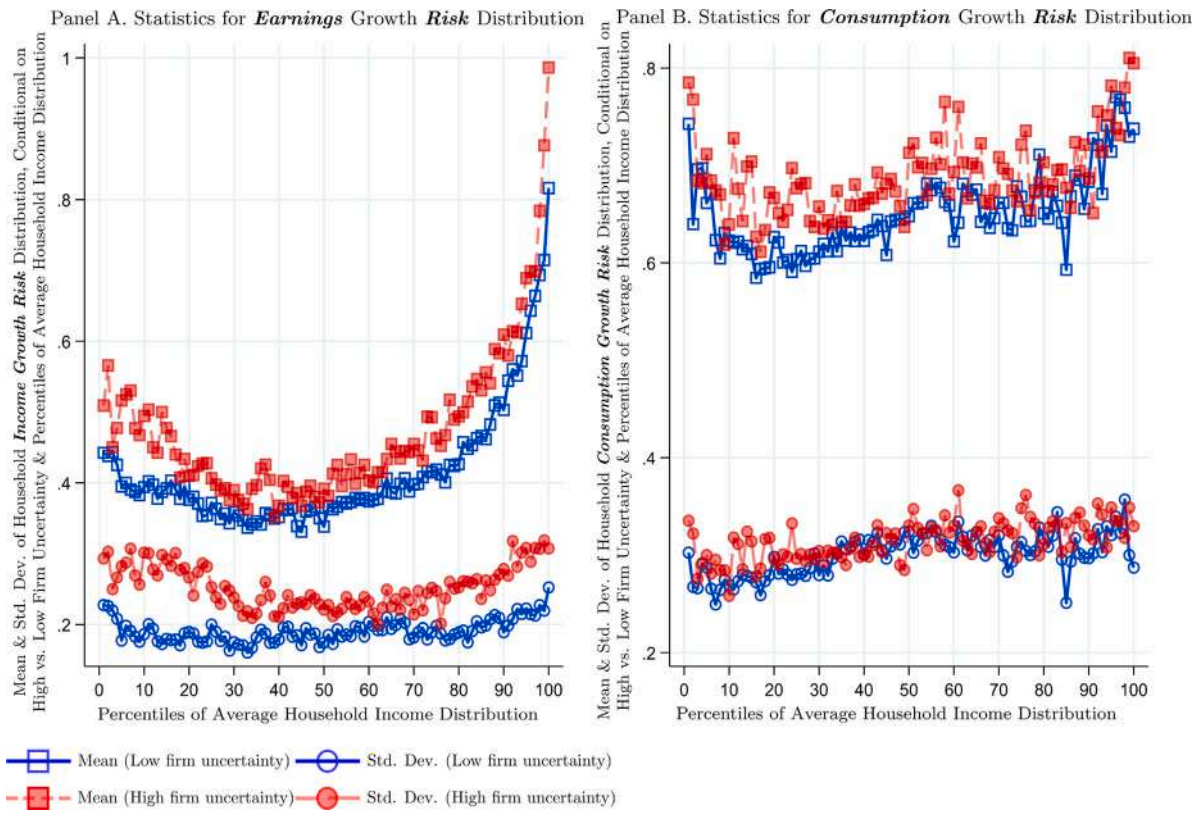

Fig. 7. The future volatilities of employee-level earnings (Panel A) and spending (Panel B) growth in response to firm uncertainty and across the income distribution. Statistics for the distribution of 12-month ahead volatility of monthly earnings and spending growth.
Notes: Panels A and B show the mean and standard deviation of the distributions of earnings and spending growth volatility, respectively, measured as the 12-month standard deviation of monthly growth over months t + 1 to t + 12, conditional on preceding 12-month firm volatility quintiles (high & low) at time t and average household income percentiles. Distributions are weighted by prior-year firm size (market equity).

ratio of income risks (high/low) indicates that worker earnings risk increases by a sizable 20% (=0.49/0.41) for employees tied to highly uncertain firms relative to those linked to more stable firms.

Second, not only does the mean of worker-level earnings risk increase but also the dispersion of earnings risk across workers, as seen in the standard deviation of the volatility of monthly income growth, which increases by a sizable 38% (=0.29/0.21 bottom right) as measured by workers' own income growth volatility—an expansion in risk that is significant at the 1% level. Using correlated coworkers' earnings growth volatility on the bottom left—which captures common peer exposure to firm shocks—indicates an even larger increase in earnings risk, of size 67% (=0.10/0.06), after spikes in employer uncertainty.

Our analysis shows that worker income risk increases in both mean and dispersion after heightened firm uncertainty. This mapping is important given that it contrasts with conclusions we would draw if limited to earnings growth dispersion alone from Panel A—a measure more typically used due to data limitations, e.g., annual data requires windows spanning decades to measure risk, horizons likely extending beyond earnings-related ties of interest.

We next examine novel consumption risk measures, which are sufficient statistics for the pass-through of not only salary-related risk but also, implicitly, other employee exposures to firms—particularly at higher income levels, where ties may go beyond salary.

4.3. Worker-level consumption risk after increases in firm uncertainty

Using the same measurements as in the analysis of Fig. 5, but for total spending, Fig. 6 presents the conditional distributions of future total spending growth rates (top Panel A) and monthly spending growth volatility (bottom Panel B) across firm uncertainty quintiles. Given the close relation between coworker and own consumption dynamics—which we confirm in Appendix Figure A.5, including for both spending growth and its volatility—Fig. 6 presents both coworker (left plots) and individual (right plots) distributions.

Fig. 6 documents several key patterns. First, the non-parametric plots of Panel A that deliberately avoid making assumptions on functional forms, confirm our key findings in Table 3 of a negative subsequent response of household spending growth to heightened firm uncertainty. This mapping holds for workers' (right plot) and coworkers' spending growth dynamics (left). Mean household spending growth is 5% lower (right) following an increase from low to high firm volatility, and is 4% (left) lower for coworkers within the firm. In both cases, their high minus low differentials are significant at the 1% level.

Second, similar to the earnings growth findings in Panel A of Fig. 5, firm second moments create cross-sectional variation in the third moment of consumption growth but not in its second moment. Specifically, for workers' own consumption (Panel A, top right), skewness of total spending growth is cross-sectionally lower and negative (−0.01) for employees at highly volatile firms while equal to 0.05 for households at firms with low uncertainty—a high-minus-low skewness difference of −0.06, significant at the 1% level based on bootstrapped tests. However, the dispersions in the distribution of own spending growth are statistically indistinguishable, with standard deviations of 0.61 and 0.60, respectively.

Third, turning to novel worker-level consumption risk measures in Panel B, mean consumption risk expands for both coworkers and own spending risk following an increase in firm uncertainty. Across low to high uncertainty, the distributional mean of coworker spending growth volatility (left plot) increases from 0.67 to 0.72 over the next year (7% increase), while individual-level consumption risk rises from 0.65 to 0.69 (6% rise)—in both cases their high minus low differentials are

significant at the 1% level. This expansion in consumption risk from worker-level volatility measures is important as it contrasts with the inference of no heightened risk drawn from examining consumption growth dispersions alone in Panel A.

Fourth, this expansion in consumption risk manifests not only through higher means but also through modestly larger dispersions in worker-level consumption growth volatility, which increase by 7% over the next year whether measured by tracking coworker (0.058/0.054) or individual purchases (0.32/0.30)—significant at the 1% level in own spending risk.

4.4. Discussion: Transmission and smoothing of risks created by uncertainty

Putting together the risk findings of the two sections above, we discuss these increased household risks in terms of the extent to which firms serve as insurance providers and households' capacity to smooth risk. We use the worker-level volatilities of earnings and consumption growth shown in the bottom right plots of Figs. 5 and 6 as our preferred measures.

While mean earnings risk rises by an economically large 20%, mean consumption risk increases by a more modest, yet still economically and statistically sizable, 7% over the next 12 months. These results have several implications. First, the pass-through of firm second moments onto an expansion in both types of household risks serves as evidence that U.S. listed firms provide at most partial insurance against adverse effects of firm-specific shocks.

Second, the smaller increase in consumption vs. earnings risk (7% vs. 20%) suggests households employ effective smoothing mechanisms. Attenuation tools can include, for example, buffer stock savings, parental support, asset sales, and credit access. The partial conversion from 20% to 7% indicates these tools are actively used. Yet, given that consumption risk still rises, these tools have important limitations in fully self-insulating households from risk created by employer uncertainty—even at the top of the income distribution, where smoothing capabilities are presumably greatest (a matter examined in the next section).

Third, our documented 7% increase in spending risk implicitly captures the combined propagation of risk across all channels of consumption exposure to firm uncertainty. This includes salary and typically hard-to-measure risks—from equity compensation to deferred benefits—all *after* households employ smoothing mechanisms. Hence, this 7% increase likely serves as an upper bound of the propagation to consumption risk after accounting for smoothing tools. Meanwhile, the 20% rise in earnings risk serves as a lower bound on the pass-through of firm volatility onto total income risk, as our earnings measures capture mostly salary-based exposure while omitting other potentially important forms of compensation.

4.5. Heterogeneity in household risks across the income distribution

The analysis so far has established key patterns in how earnings and consumption risks expand across high and low employer uncertainty. However, the properties of these expanded risks may vary systematically with worker earnings, as employees at different parts of the income distribution may face distinct channels of firm exposure—including salary-related and other forms of compensation—resulting in heterogeneous degrees of risk propagation.

For example, household risks may be higher for low-income workers who face greater employment adjustment margins that affect their earnings risk, while high-income workers may be exposed to equity- and option-linked compensation that may not be fully diversifiable due to lock-in periods and trading restrictions, amplifying consumption risk. Moreover, spending risk may also vary across income levels due to differences in consumption smoothing capabilities. For instance, despite facing elevated earnings risks, high-income households may have access to additional mechanisms to mitigate firm-related risks.

Using our preferred measures of earnings and spending risks based on worker-level future volatilities (bottom right plots of Figs. 5 and 6, respectively), Fig. 7 presents side-by-side key statistics for the distributions of these risks (*i*) across every percentile of the household income distribution, and (*ii*) across high vs. low firm uncertainty quintiles.

Panel A shows that earnings risk exhibits strong heterogeneity across income levels. The mean of worker-level earnings growth volatility (square symbols) follows a U-shaped pattern. Earnings risk is highest among both low- and high-income workers, while those around the middle of the distribution experience substantially lower risk. This effect is particularly pronounced for high earners above the 80th percentile. Importantly, the impact of firm uncertainty on earnings risk (comparing red versus blue hollow squares) varies across income levels, is larger at both ends compared to middle earners, and shows seemingly exponential increases above the 95th percentile, leading to the top 1% of earners experiencing the highest earnings risk in response to firm uncertainty. This pattern likely reflects greater variability in bonuses and incentives at higher income levels, and larger employment adjustment margins for lower-income workers. Similar to the means, the dispersion of worker-level earnings risk (circles) is also higher under firm uncertainty—consistently so at every percentile. Although less pronounced, it follows a similar U-shaped pattern, indicating that even within narrow income percentile groups, dispersion in worker earnings risk increases with firm uncertainty.

Panel B shows that consumption risk also exhibits heterogeneity across the income distribution, and its side-by-side comparison with earnings risk patterns provides new insights into households' ability to insulate against firm uncertainty through smoothing mechanisms. The mean of worker-level spending growth volatility under low firm uncertainty (blue hollow squares from left to right) follows a U-shaped pattern from the lowest earners up to about the 55th percentile, after which it roughly plateaus until approximately the 90th percentile before rising again for the highest earners. Similar to earnings risk patterns, consumption risk expands for households tied to highly uncertain firms (red squares above blue hollow squares) at almost all income percentiles. Moreover, the magnitude of consumption risk under high uncertainty is most pronounced at both ends of the distribution—with the bottom and top earners experiencing the largest consumption risk when firm uncertainty is high (red squares at the highest on the y-axis). Further, the plateau region starting around the 60th percentile highlights the imperfect transmission of earnings to consumption risk. While earnings risk continues to rise steadily with income, consumption risk remains relatively flat for some middle-to-upper-income households—suggesting they can partially self-insulate despite facing increasing earnings exposure, yet heightened risk re-emerges past the 90th percentile.

Importantly, if the U-shaped pattern seen in earnings risk transferred almost intact to consumption risk (perhaps a less economically interesting finding), it would suggest households effectively lack mechanisms—or find these tools ineffective—for reducing risk originating from heightened employer uncertainty. Instead, we observe that the U-shaped pattern is still visible yet only imperfectly transferred and notably attenuated, with features like the plateau region. This pattern indicates two key findings: (*i*) smoothing mechanisms are indeed effective (the U-shape weakens), yet (*ii*) firm uncertainty creates fundamental consumption risk for households that cannot be fully mitigated (the pattern persists).

The highest earners provide particularly striking evidence of these limits to smoothing: despite presumably having the greatest access to risk management tools, the top 2% of earners still face the largest consumption risk and at levels comparable to the large risk seen at the bottom 2% of earners (note similar risk, red squares, on the y-axis). This inability to reduce consumption risk below the levels faced by the lowest-income households (let alone below that of any other percentile group), who likely have far fewer smoothing mechanisms available, indicates that even the substantial risk management capabilities available

to the highest earners cannot fully offset the micro pass-through of firm uncertainty shocks onto consumption risk. In addition to salary risk, this persistent increase in consumption risk among top earners likely reflects their reliance on inherently volatile compensation structures tied directly to firm performance and its uncertainty—e.g., conditioned stock and options grants and fundamentals-based bonuses—that remain difficult to fully diversify.

4.6. Additional findings

The Online Appendix presents additional results. Notably, the expansion in consumption risk is visible even when consumption is decomposed into major categories, with consistent rightward shifts in the distributions of spending risk across low to high firm uncertainty. Interestingly, the data also show a pecking order in risk smoothing: while lowest-income households experience large increases in broad non-durables and services risk, they show no increase in grocery spending risk. This indicates low earners engage in prioritized insulation of necessary expenditures at the expense of bearing higher consumption risks elsewhere.

We also examine differential responses in household spending and saving behaviors conditional on a critical firm fundamental: latest-year employment growth. We find that households employed by firms that recently experienced low employment growth—including those undergoing layoffs—exhibit high sensitivity to firm uncertainty shocks. These results suggest that firm uncertainty combined with corporate layoffs creates a gloomier outlook for households, leading to sharper adjustment in cautious spending and savings behavior.

5. Conclusion

Understanding consumer behavior in response to increases in uncertainty is both at the heart of economic theory and of policymaker interest due to its importance for business cycles. However, quantifying its effects on typical day-to-day household choices has proven remarkably challenging. This is not only because of unavailability of data to measure actual daily household decisions—and track adjustments in these over time—but also because of challenges in identifying exogenous shocks that create measurable uncertainty for households.

Using daily transactions for spending and banking activity for 57,000 workers and real-time measures of uncertainty for 870 publicly traded U.S. firms, we provide new evidence that employer-specific uncertainty persistently reduces future monthly spending and spurs precautionary savings. Consistent with aggregate correlations in Fig. 2, these micro cutbacks include typical expenditures on non-durable goods and services and increases in bank balances, yet the responses are unique to the firm-to-household propagation of uncertainty effects rather than responses to economy-wide volatility.

Critical to our contribution are monthly measures of consumption and earnings growth risk—measured by tracking workers' future 12-month standard deviations of monthly growth rates (i.e., second moment household measures)—which show significant increases after rises in employer uncertainty. These risk expansions vary across the income distribution, with low- and high-income households particularly affected. More generally, our micro evidence indicates that employers provide only partial earnings insurance to workers, while households can only partly self-insulate their consumption from the adverse impact of uncertainty.

Notably, our findings reveal how firm-level uncertainty is able to generate important stylized patterns in household income dynamics, including business cycle features. These overlooked effects are likely to have important aggregate implications. With surging uncertainty due to global tensions—including escalating trade disputes, wars, pandemics, and financial crises—policy interventions aimed at reducing uncertainty for firms may have meaningful effects in stimulating economic growth and recovery. Our evidence of heterogeneous increases in household risks suggests that targeted policies toward groups of the population particularly affected by firm uncertainty may be effective countercyclical tools. Future work on models that incorporate the idiosyncratic propagation of uncertainty from firms onto households under general equilibrium conditions should allow for better understanding of its effects on business cycles. Our work also points to understanding further how firm uncertainty effects on households can be largely amplified by other simultaneous shifts, such as drops in firm valuations and market wide shocks to trade, inflation, and interest rates, as important directions for future research and policy guidance.

CRediT authorship contribution statement

Iván Alfaro: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Hoonsuk Park:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

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