The Present Value of Future Market Power*

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Abstract

We introduce a novel log-linear identity linking a company's market value to expected future markups, output growth, discount rates, and investments within a present-value framework. By distinguishing between realized and expected markups, we unveil five new empirical facts. (i) *Expected* markups account for one-third of the rise in aggregate firm values of U.S. public firms since 1980. (ii) The rise in aggregate expected markups is driven by a reallocation of market share towards high-expected-markup firms and a within-firm rise in expected markups. Mergers have accelerated this trend with expected (but not realized) markups rising immediately post merger. (iii) Expected markups are closely tied to fixed costs and investments, particularly in intangibles. (iv) There is a negative time-series relationship between expected markups and discount rates, but (v) there is a positive cross-sectional link to risk premia after accounting for other risk factors. These five facts can guide the development of macro-finance models.

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1 Introduction

In recent decades, there has been a notable upsurge in firms' market power and valuations, accompanied by a decline in investors' required returns (i.e., firms' cost of capital), output growth, and corporate investments both in the U.S. and internationally.[1] Several theories identifying different economic forces have been proposed to explain various combinations of these "secular" trends.[2] We show that all five trends naturally combine into a present-value identity that harnesses the forward-looking nature of asset prices rather than backward-looking accounting information, and does not rely on structural assumptions.

Our contribution is twofold. First, we derive a novel log-linear present-value identity that decomposes firm value into four determinants: any variation in market value over output (m) reflects changes in expected future output growth (Δy), markups (μ), fixed costs and investments over output (fci), or returns (r),

$$m_{i,t} \approx k + \sum_{\tau=1}^{\infty} \rho^{\tau-1} \mathbb{E}_t \Delta y_{i,t+\tau} + \phi_1 \sum_{\tau=1}^{\infty} \rho^{\tau-1} \mathbb{E}_t \mu_{i,t+\tau} - \phi_2 \sum_{\tau=1}^{\infty} \rho^{\tau-1} \mathbb{E}_t fci_{i,t+\tau} - \sum_{\tau=1}^{\infty} \rho^{\tau-1} \mathbb{E}_t r_{i,t+\tau}, \quad (1)$$

where k, ρ, ϕ_1, and ϕ_2 are constant coefficients and i and t index a firm and time, respectively. We show that (1) holds tightly in the data. This framework is particularly useful when economists want to study the dynamics of market power, which often translates into higher markups with a delay. As an example, Crouzet and Eberly (2018) have shown that, while concentration and productivity in the retail sector both increased from 1989 to 2015, markups did not change. Our estimates based on present values indicate that *expected future* markups of firms in the retail sector have

[1] De Loecker, Eekhout, and Unger (2020) and Autor, Dorn, Katz, Patterson, and Van Reenen (2020) document the rise in average market power measured by markup and product market concentration, respectively. Avdis and Wachter (2017) and Barkai (2020) document the decline in discount rates. The patterns in asset prices, output, and investment are documented in Gutiérrez and Philippon (2017) and Farhi and Gourio (2018) among several others.

[2] For instance, Caballero, Farhi, and Gourinchas (2017), Farhi and Gourio (2018), Liu, Mian, and Sufi (2022), and Gutiérrez, Jones, and Philippon (2021), among others.

consistently risen since the early 1980s. Eventually, by 2020, realized markups in the retail sector have sharply increased, as captured by asset prices long before then.

Second, using data on U.S. public firms we establish five new empirical facts:

1. Around one-third of the rise in the aggregate market value of U.S. public firms between 1982 and 2020 can be attributed to the rise in expected future markups net of expected fixed costs and investments. Lower discount rates and higher expected long-run output growth account for around one-third, each.

2. The upward trend in average markup expectations reflects both a reallocation of market share towards firms with higher expected markups and a within-firm rise in expected markups. Some of the reallocation towards high-expected-markup firms occurs through mergers and acquisitions, which mechanically raise the acquirer's market share. We further document the role of M&A in the within-firm rise in expected markups using a dynamic difference-in-differences approach. We find that post-acquisition markup expectations for the merged company rise relative to the combined pre-acquisition stand-alone values.

3. Expectations of long-run markups are closely tied to expectations of long-run fixed costs and investments. The rise in expected fixed costs and investments offsets almost half of the effect of rising markups on valuations.

4. In the time series, positive shocks to expected markups ("markup news") are associated with negative shocks to discount rates.

5. In the cross-section, firms with higher expected future markups earn higher average returns after controlling for other potential drivers of risk premia.

The first result highlights the importance of markups in understanding cross-firm differences in market values or time-series variation in aggregate firm valuations. A common interpretation of the seminal findings by Campbell and Shiller (1988) is that asset-price variation is predominantly driven by discount rates. Instead, our findings reveal that since the early 1980s, much of the low-frequency trend in the market value-to-output ratio has been cash-flow driven. Specifically, two-thirds of this trend can be attributed equally to output growth and markups (net of fixed costs and investments), while only one-third is due to falling discount rates. As a back-of-the-envelope calculation, our estimates are consistent with a decline in total discount rates between 1980 and 2020 of 1 percentage point, corroborating Farhi and Gourio's (2018) argument that a rise in the equity premium has partially offset the drop in risk-free interest rates.[3]

The second result shows that market share reallocation toward high-markup firms has been a key driver of the aggregate rise in expected markups. This finding echoes a similar result by De Loecker, Eekhout, and Unger (2020) for realized markups. Unlike realized markups, however, expected markups also rise for the average firm in the economy. Mergers and acquisitions play a role in both the reallocation and within-firm channels underlying the upward trend in expected markups: in addition to reallocating market share towards acquiring firms, mergers tend to raise expected markups for the combined firm relative to the pre-merger sum of the parts. Interestingly, this result only holds for markup expectations and not for realized markups, which only show a statistically detectable rise five years after the merger.

This discrepancy underscores the key conceptual insight of our present-value identity: financial market valuations incorporate forward-looking information about a firm's long-run markup trajectory extending far beyond near-term markup realizations. Specifically, we find that variation

[3]The distinction between cash-flow and discount-rate-driven changes in asset prices also matters for their effect on inequality. Fagereng, Gomez, Gouin-Bonenfant, Holm, Moll, and Natvik (2023), for instance, characterize the redistributive effects of a discount-rate-driven rise in asset prices from net savers to dis-savers. Our results suggest that this channel only applies to one-third of the aggregate rise. Nonetheless, the remaining increase may reflect expectations of other redistributive trends: higher expected markups indicate gains to producers at the cost of consumers, while rising fixed costs may reflect a larger 'cut' of those gains taken by high-skilled labor as providers of intangible capital (Eisfeldt and Papanikolaou, 2014).

in asset prices and variation in realized (current) markups account for a similar share of the variation in long-run expected markups. More importantly, realized markups predominantly explain short-term expected markups, while asset prices capture long-horizon expectations.

The third result highlights the tight link between expected markups and expected fixed costs and investments. A strong relationship between expected markups and valuation ratios is closely associated with an offsetting relationship between valuation ratios and investments. This result is consistent with market power arising from and relying on investments in physical and intangible capital (Crouzet, Eberly, Eisfeldt, and Papanikolaou, 2022) and implies that markups should not be examined as stand-alone quantities when studying their impact on asset prices.

Our fourth result emerges from a decomposition of unexpected returns ("return news") following Campbell (1991) into news about future discount rates, markups, output growth, and fixed costs and investments. We observe that all cash-flow news components correlate negatively with discount-rate news, consistent with results from related but distinct present-value decompositions by Lochstoer and Tetlock (2020) and Cho, Kremens, Lee, and Polk (2024). Our findings imply that news of higher markups is associated with lower subsequent returns.

At first glance, the fourth finding appears to contradict theoretical and empirical arguments suggesting a positive relationship between market power and risk premia (e.g., Bustamante and Donangelo, 2017; Barrot, Loualiche, and Sauvagnat, 2019; Corhay, Kung, and Schmid, 2020; Grotteria, 2023). However, our fifth result overturns this conclusion. We evaluate the relation between expected markups and expected returns through standard asset pricing tests that allow us to control for other well-established risk factors. We sort firms into quintile portfolios based on their expected markups. We then regress the portfolio returns on common risk factors and document that a long-short portfolio earns significantly *positive* excess returns of 4.6% per year. We conclude that markups are indeed positively associated with risk premia as predicted by theoretical work. More importantly, the same positive relation between markups and returns does not hold when we construct portfolios based on the *realized* rather than *expected* markups.

Related literature. Our empirical exercise is closely related to the work of De Loecker et al. (2020), which documents the evolution of the firm-level markup distribution and notes that the rise in average markups is predominantly driven by market-share reallocation towards high-markup firms. To rigorously tie markups to asset prices, discount rates, growth, and investment, we extend their empirical description to long-run markup *expectations* within a novel present-value decomposition. As such, we also contribute to the large and growing literature on rising market power and its macroeconomic implications.[4]

Our paper is related to the news-driven business cycle theories (e.g., Beaudry and Portier, 2006) that leverage the forward-looking information in stock prices to describe the shocks driving real business cycles and their lead-lag relationships with productivity, consumption, and investment. Similarly to Grullon, Larkin, and Michaely (2019), our focus on asset prices is aimed at studying market power and markups. In comparison to both papers, we embed our empirical exercise in a rigorous present-value framework. Our methodology builds on the literature on present-value decompositions (e.g., Campbell and Shiller, 1988; Campbell, 1991; Vuolteenaho, 2002; Cohen, Polk, and Vuolteenaho, 2003). Cho et al. (2024) further refine the Vuolteenaho-expression of market-to-book ratios to distinguish between profitability and expansion as drivers of cash flows. Donangelo (2021) extends the present-value framework to labor-induced operating leverage. Our new decomposition of market value-to-output, instead, expresses the cash-flow component of valuations in terms of output growth, markups, and investments to speak to the motivating "secular" trends. Since output growth, markups, and investments—unlike, for instance, earnings growth or return on equity—are independent from the firm's capital structure, we derive an expression for the total market value, rather than just its equity.

[4] See, e.g., the survey articles by Syverson (2019) and Basu (2019).

Using structural restrictions, recent works relate asset prices to markups and discount rates (Farhi and Gourio, 2018; Crouzet and Eberly, 2019; Corhay, Kung, and Schmid, 2021), factor shares (e.g., Eggertsson, Robbins, and Wold, 2018; Greenwald, Lettau, and Ludvigson, 2019; Barkai, 2020), and concentration (Gutiérrez and Philippon, 2017). Others tie concentration to investments and intangibles (Crouzet and Eberly, 2018; Hartman-Glaser, Lustig, and Xiaolan, 2019; Gutiérrez, Jones, and Philippon, 2021). We find that several of our findings, obtained without structural restrictions, are indeed consistent with key takeaways from this literature. Our decomposition features a term that aggregates fixed costs and capital expenditures, and thus neatly nests investments in physical capital and intangibles (Eisfeldt and Papanikolaou, 2014; Crouzet and Eberly, 2019, 2023).

Closer to the asset pricing literature, we use our forward-looking expressions of markups to assess the role of markups in risk premia. We find a positive cross-sectional relationship, consistent with theoretical arguments in Bustamante and Donangelo (2017), Barrot et al. (2019), Corhay et al. (2020), and Grotteria (2023). On the other hand, our news decomposition points to a negative time-series relationship between discount rates and markups, consistent with Liu et al. (2022) and Dou, Ji, and Wu (2021).

2 Future Market Power in a Present-Value Relation

This section develops a log-linear decomposition of a firm's market value normalized by output into long-run expectations of its future (i) firm-level returns, (ii) firm-level output growth, (iii) markups, and (iv) fixed costs and investments in both physical and intangible capital. In particular, the relation implies a natural expression for the *present value* of future markups.

The firm Without loss of generality, firm i at time t incurs variable cost $VC_{i,t}$ and fixed cost $FC_{i,t}$ to produce output $Y_{i,t}$. The firm uses operating profits (that is, $Y_{i,t} - VC_{i,t} - FC_{i,t}$) and net issuance of debt or equity $ISS_{i,t}$ to finance investment $I_{i,t}$ and cash distributions $D_{i,t}$ to equity and debt holders:

$$I_{i,t} + D_{i,t} = (Y_{i,t} - VC_{i,t} - FC_{i,t}) + ISS_{i,t} \tag{2}$$

The time-t return to investors who owned the firm's equity and debt at time $t-1$ satisfies

$$1 + R_{i,t} = \frac{M_{i,t} - ISS_{i,t} + D_{i,t}}{M_{i,t-1}}, \tag{3}$$

where $R_{i,t}$ is the value-weighted return on the firm's equity and debt and $M_{i,t}$ is the market value of the firm's assets after time-t distributions. Using (2), we obtain

$$1 + R_{i,t} = \underbrace{\frac{M_{i,t}}{M_{i,t-1}}}_{\text{Change in the market value}} \underbrace{\left(1 + \frac{Y_{i,t} - VC_{i,t} - FCI_{i,t}}{M_{i,t}}\right)}_{\text{Net payout}} \tag{4}$$

where $FCI_{i,t} \equiv FC_{i,t} + I_{i,t}$ combines fixed costs and investments.[5] That is, the return on the firm comes from either a change in the market value of the firm or the net payout, which equals output minus variable costs, fixed costs, and investments.[6]

To introduce markups, defined as the ratio of output price to marginal cost, we use the variable-cost-to-markup relation implied by the firm's cost minimization (De Loecker and Warzynski, 2012):

$$\mu_{i,t} = \log\left(\theta_{i,t} \frac{Y_{i,t}}{VC_{i,t}}\right), \tag{5}$$

where $\mu_{i,t}$ is (log) markup and $\theta_{i,t}$ is the output elasticity of variable input. This relationship holds regardless of the firm's production technology, as long as the firm engages in cost minimization.

[5]The fixed cost term includes expenses like R&D, advertising, and SG&A, which are often linked to investment in intangibles (Eisfeldt and Papanikolaou, 2014). Combining fixed costs and physical investments thus has the interpretational benefit of treating investments in intangible and physical assets symmetrically. The combination further ensures that FCI is rarely negative, which delivers practical benefit in the log-linear framework. In a robustness test, we assign 30% of SG&A to $FC_{i,t}$ and the remainder to $VC_{i,t}$, following Eisfeldt, Falato, and Xiaolan (2022).

[6]Any investment adjustment costs are assumed to be absorbed by the fixed costs or the investment term.

Log-linearization Plugging (5) into (4), taking logs of both sides and rearranging, we obtain

$$r_{i,t} = m_{i,t} - m_{i,t-1} + \Delta y_{i,t} + \widetilde{s}_{i,t}. \tag{6}$$

where $m_{i,t} = \log(M_{i,t}/Y_{i,t})$ is the market-to-output ratio and $\Delta y_{i,t} = \log(Y_{i,t}/Y_{i,t-1})$ is log output growth. The last term in (6) is nonlinear in the underlying variables:

$$\widetilde{s}_{i,t} = \log\left(1 + \exp(-m_{i,t})\left(1 - \theta_{i,t}\exp(-\mu_{i,t}) - \exp(fci_{i,t})\right)\right). \tag{7}$$

where $fci_{i,t} = \log\left(\frac{FCI_{i,t}}{Y_{i,t}}\right)$ is log fixed costs and investments scaled by output. Equation (6) holds regardless of whether we express $\Delta y_{i,t}$ and $r_{i,t}$ in real or nominal terms. For consistency with past works in the present-value literature, we work with nominal quantities.

Approximating $\widetilde{s}_{i,t}$ in (7) around the long-run average values of $(m_{i,t}, \theta_{i,t}, \mu_{i,t}, fci_{i,t})$, we obtain the following approximation, denoted by $s_{i,t}$ (see Appendix A for the derivation):

$$\widetilde{s}_{i,t} \;\approx\; s_{i,t} = -\left(1-\rho\right)m_{i,t} + \phi_1\mu_{i,t} - \phi_2 fci_{i,t}, \tag{8}$$

where ρ is close to but less than one and the ϕ terms are constant coefficients.

Rearranging (6) using (8) we obtain

$$m_{i,t-1} \approx \phi_0 + \rho m_{i,t} + \Delta y_{i,t} + \phi_1\mu_{i,t} - \phi_2 fci_{i,t} - r_{i,t}. \tag{9}$$

This present-value relation expresses today's market value-to-output ratio as a linear combination of five components (plus a constant). The approximation holds tightly in the data. Figure 1 plots the fit of the firm-level approximation for Apple Inc. and Berkshire Hathaway Inc.. We find that our log-linear decomposition explains around 98% of the variation in the left-hand side.

Iterating (9) forward and imposing the transversality condition $\lim_{\tau\to\infty}\rho^{\tau}m_{i,\tau}=0$ yields the long-run expression for a firm's log market value-to-output ratio:

$$m_{i,t}\approx k+\sum_{\tau=1}^{\infty}\rho^{\tau-1}\Delta y_{i,t+\tau}+\phi_1\sum_{\tau=1}^{\infty}\rho^{\tau-1}\mu_{i,t+\tau}-\phi_2\sum_{\tau=1}^{\infty}\rho^{\tau-1}fci_{i,t+\tau}-\sum_{\tau=1}^{\infty}\rho^{\tau-1}r_{i,t+\tau}, \tag{10}$$

where k is a constant. A high market value compared to output (m) means that one or more of the following is true about the firm: (i) future output growth (Δy) is high; (ii) future markup (μ) is high; (iii) future fixed costs and investments (fci) are low; or (iv) future returns (r) are low.

We obtain an ex-ante version of the present-value identity (10) by taking a time-t expectation on both sides:

$$\begin{aligned} m_{i,t} \;\approx\; k \;+\; \sum_{\tau=1}^{\infty}\rho^{\tau-1}\mathbb{E}_t\Delta y_{i,t+\tau} \;+\; \phi_1\sum_{\tau=1}^{\infty}\rho^{\tau-1}\mathbb{E}_t\mu_{i,t+\tau} \;-\; \phi_2\sum_{\tau=1}^{\infty}\rho^{\tau-1}\mathbb{E}_t fci_{i,t+\tau} \\ -\sum_{\tau=1}^{\infty}\rho^{\tau-1}\mathbb{E}_t r_{i,t+\tau}. \end{aligned} \tag{11}$$

A firm's market value does not reflect current markups, growth, or investments but the *present value* of their expected future quantities. Importantly, the approximate relation in (11) holds with respect to any expectation—rational or irrational—that respects the firm's budget constraint (2).

3 Empirical results

3.1 Data and Specification

We use data on U.S. firms whose stock is publicly traded between 1960 and 2020 from Compustat and the Center for Research in Security Prices (CRSP). We convert the monthly data from CRSP to annual frequency and merge them with annual accounting data from Compustat. When doing so, we aggregate the CRSP market equity variables at the firm level when firms issue multiple shares and correct for delisting using the approach suggested by Shumway (1997). All stocks are required to be domestically incorporated (CRSP share code of 10 or 11) and listed on one of the three major exchanges (i.e., NYSE, Nasdaq or AMEX). We exclude firms with missing market equity data in the current or previous month and with missing data for property, plant and equipment or selling, general and administrative expenses, as well as firms in the bottom decile of book asset value. We exclude financial firms defined as those with SIC codes between 6000 and 6999.

The market value of assets of firm i at time t is computed as the sum of the market value of equity and the book value of debt:

$$M_{i,t} = P_{i,t}N_{i,t} + Z_{i,t},$$

where $P_{i,t}$ is the stock price, $N_{i,t}$ the number of shares, and $Z_{i,t}$ the book value of debt. This definition assumes that debt is issued and trades at par. While this omits variation in market prices of corporate debt, the assumption avoids difficulties in measuring firm market values of debt, particularly for non-bond corporate debt. Most corporate loans have floating rates and corporate bonds are predominantly issued with maturities of five or seven years, and typically callable, such that their effective duration in a sample of falling interest rates is also low. As a result, the par assumption is relatively innocuous with respect to the effect of risk-free interest rate variation on debt values. For both floating- and fixed-rate debt, the effect of variation in credit spreads on returns is likely tamed by within-firm mean-reversion when we consider long-run expected returns in the last term in Equation (11). We define the weighted average return on the firm's securities as

$$1 + R_{i,t} = \frac{(P_{i,t} + Div_{i,t})N_{i,t-1} + Z_{i,t-1} + INT_{i,t}}{P_{i,t-1}N_{i,t-1} + Z_{i,t-1}},$$

where $Div_{i,t}$ is the dividend per share and $INT_{i,t}$ is total firm-level interest payments on debt.

We use the accounting information in Compustat to construct other firm-level variables. Output ($Y_{i,t}$) is measured by sales. Fixed costs and investments ($FCI_{i,t}$) is measured as the sum of the selling, general, and administrative expense (Compustat item `XSGA`), advertising expense (`XAD`), research and development expense (`XRD`), depreciation and amortization (`DP`), and the change in property, plant, and equipment (`PPEGT`) from the previous year. The first four variables are assumed to be zero whenever they are missing in Compustat. We exclude observations with missing `PPEGT`.

We use markups estimated by De Loecker et al. (2020) using the firm-level production approach (De Loecker and Warzynski, 2012). To measure the output elasticity $\theta_{i,t}$ in (5), we follow De Loecker et al. (2020) estimates of a parametric production function that varies by year and industry (two-digit NAICS).

For the parameters ρ, ϕ_1, and ϕ_2 in (9), we estimate a WLS panel regression of

$$m_{i,t-1} - \Delta y_{i,t} + r_{i,t} = \phi_0 + \rho m_{i,t} + \phi_1 \mu_{i,t} - \phi_2 fci_{i,t} + \varepsilon_{i,t}.$$

We find $\rho = 0.98$, $\phi_1 = 0.05$, and $\phi_2 = 0.04$.

Equation (11) is an accounting identity in expectations of future quantities. As standard in the literature using the present-value framework, we estimate these expectations using vector autoregressions (VAR). Specifically let $z_{i,t}$ be $[r_{i,t}, \Delta y_{i,t}, \mu_{i,t}, fci_{i,t}, m_{i,t}, lev_{i,t}, capex_{i,t}, ag_{i,t}, ms_{i,t}]$, where the latter four variables denote a firm's leverage, capex net of depreciation, asset growth, and market share, respectively. We estimate the following firm-level VAR:

$$z_{i,t+1} = a + Bz_{i,t} + u_{i,t+1}, \tag{12}$$

using weighted-least-squares regressions placing equal weights on all years and relative cross-sectional weights according to the firms' market values within each year. The estimated coefficient matrix B is reported in Table 1. Appendix B further shows that our main results are robust in a more parsimonious VAR system in which $z_{i,t}$ contains only $[r_{i,t}, \Delta y_{i,t}, \mu_{i,t}, fci_{i,t}, m_{i,t}]$.

3.2 Firm-level results: Markups, investments, and valuations

An important point of our paper is that asset prices capture expected future markups and investments in intangible and physical capital rather than just their current, realized counterparts. Next, we use these VAR-implied quantities for a variance decomposition of firm-level market value-to-output ratios. The VAR estimates the expected, discounted, infinite-horizon sums of returns, output growth, markups, and fixed costs/investment, that is, the terms on the right-hand side of the present-value identity (11). Taking a covariance of each side of (11) with $m_{i,t}$ and dividing by its variance, we obtain

$$\begin{aligned} 1 = & \frac{cov\left(\sum_{\tau=1}^{\infty}\rho^{\tau-1}\mathbb{E}_t\Delta y_{i,t+\tau}, m_{i,t}\right)}{var\left(m_{i,t}\right)} + \frac{cov\left(\phi_1\sum_{\tau=1}^{\infty}\rho^{\tau-1}\mathbb{E}_t\mu_{i,t+\tau}, m_{i,t}\right)}{var\left(m_{i,t}\right)} \\ & - \frac{cov\left(\phi_2\sum_{\tau=1}^{\infty}\rho^{\tau-1}\mathbb{E}_t fci_{i,t+\tau}, m_{i,t}\right)}{var\left(m_{i,t}\right)} - \frac{cov\left(\sum_{\tau=1}^{\infty}\rho^{\tau-1}\mathbb{E}_t r_{i,t+\tau}, m_{i,t}\right)}{var\left(m_{i,t}\right)}. \end{aligned} \tag{13}$$

Each of the right-hand side terms is an OLS-coefficient from a univariate regression on $m_{i,t}$ that attributes fractions of market value-to-output variation across firms and years to expected long-run (i) output growth, (ii) markups, (iii) fci, and (iv) discount rates. Table 2 reports the results.

Variation in expected markups accounts for around 63% of market value-to-output variation. Output growth accounts for 47% and fixed costs/investments for around 49% but in the opposite direction. Discount rates account for slightly more than one-quarter, with the rest attributed to the cumulative approximation error. Panel B reports the same decomposition for cross-sectional variation, by including year fixed effects, with almost identical results. This cross-sectional variation is largely intra- rather than inter-industry: Panel C reports the results with industry-year fixed effects with similar results to Panel B.

Focusing instead on the within-firm time-series variation (Panel D), the discount rate share rises to 36% while the markup share falls to 45% and the fci-share shrinks to -35%. The smaller share of expected future markups in within-firm variation suggests that to markup expectations are less volatile or cyclical in the time series than, growth and especially discount-rate expectations. Our finding that the results in Panel A resemble the cross-sectional results in Panel B more closely than the time-series results in Panel D suggests that a large part of the panel variation in firm-level valuations is driven by differences across firms.

We repeat the cross-sectional decomposition by industry, using two-digit NAICS codes. Figure 2 plots the markup share against the fci share by industry: industries in which expected markups drive a large share of variation are also those in which fixed costs account for a larger, offsetting share. Valuation differences in industries like manufacturing (NAICS code 32, including chemicals and pharmaceuticals), information (51, including software and media), or professional services (54) are predominantly driven by the markup-fci trade-off; valuations in industries like transportation and warehousing (49) and, especially, agriculture (11) are less correlated with these two components and accordingly driven more by differences in firm-level output growth and/or discount rates. Expected markups are highly correlated across both time and firms with expected fixed costs. The core result from the exercises in Table 2 and Figure 2 is that valuations are highly sensitive to the firm-level trade-off between markups and investments.

Next, we evaluate the importance of asset prices for the variation of expected markups while controlling for realized current markups. It is ex-ante unclear whether asset prices (m) meaningfully contribute to variation in firms' expected future markups relative to past and current markups (μ), especially given the high auto-correlation in firm-level markups as measured by De Loecker et al. (2020) (roughly 0.88). We write expected future markups for firm i at time t as a linear function of current markups and asset prices:

$$\sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t \mu_{i,t+\tau} = \alpha + \beta_0 \mu_{i,t} + \beta_1 m_{i,t} + \varepsilon_{i,t} \tag{14}$$

suggesting the following decomposition

$$
\begin{aligned}
1 =& \beta_0 \frac{cov\left(\sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t \mu_{i,t+\tau}, \mu_{i,t}\right)}{var\left(\sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t \mu_{i,t+\tau}\right)} + \beta_1 \frac{cov\left(\sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t \mu_{i,t+\tau}, m_{i,t}\right)}{var\left(\sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t \mu_{i,t+\tau}\right)} \\
&+ \frac{var\left(\varepsilon_{i,t}\right)}{var\left(\sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t \mu_{i,t+\tau}\right)}. \qquad (15)
\end{aligned}
$$

Table 3 reports our estimates together with the percentiles from a non-parametric bootstrap that allows us to consider jointly sampling uncertainty in the regression coefficient estimates in (14) and (15). We randomly sample firms with replacement and draw the whole history of the sampled firms to maintain the auto-correlation structure at the firm level. To capture the sampling uncertainty of the original sample, the size of the resampled data is the same as the size of the original data. In each bootstrapped sample, we estimate the relative contribution of current markups, asset prices, and the residual component from (14) and retain the distribution of the estimates.

We find that current markups and current market value-to-output ratios explain similar shares—close to 50% each—of the variation in VAR-implied long-run markups. The residual component from (14) explains around 1% of the variation. This result shows that, beyond the information in current markups, asset prices contain a comparable amount of complementary information about future markups.

We then split the infinite sum into short and long-horizon markup expectations and repeat the same decomposition. Unsurprisingly given their persistence, observed markups are the dominant contributor to variation in short-run markup expectations (93% for years 1 to 5, 76% for years 1 to 15). Long-run VAR-implied markup expectations, however, are predominantly driven by variation in current asset prices (54% after 5 years, 61% after 15 years). That is, the present-value framework and its use of forward-looking asset prices are particularly helpful in assessing market expectations of longer-term markup and market-power trajectories.

3.3 Aggregate time-series variation

We now translate the firm-level results into a decomposition of the aggregate time series. To this end, we decompose the aggregate market value-to-output ratio into expected markups, expected output growth, expected fci, and expected discount rates.[7] Figure 3 plots this decomposition year-by-year. The aggregate market value-to-output has risen sharply between 1982 and 2000, and then again between 2010 and 2020. The concurrent fall in discount rates accounts for around one-third of the 1982-2020 rise, and an increase in expected output growth contributes another third.

The contribution of discount rates to variation in aggregate valuations appears low in comparison to a common interpretation of previous findings (e.g., Campbell and Shiller, 1988). We note three potential reasons for this. (i) Frequency: the VAR is estimated on annual data but the cited numbers refer to the trough-to-peak variation from 1982 to 2020 and therefore exclude inter-year mean-reversion in discount rates. (ii) Choice of valuation ratio: using market value-to-output implies that the cash-flow component is made up of output growth and markups net of fixed costs, rather than dividend growth. Different cash-flow terms have different predictability properties. (iii) Firm-level VAR: we estimate the VAR at the firm level and then aggregate, thus using additional information from the cross-section to predict the relevant state variables. Predictable information from the cross-section is particularly relevant for the aggregate decomposition if variation in the aggregate is meaningfully driven by compositional dynamics. Lochstoer and Tetlock (2020) point out that the results for portfolios may differ depending on whether the underlying VAR is estimated at the firm or portfolio level.

Valuations positively predict markups, implying that the upward trend in the market value-to-output ratio is associated with an upward trend in expected long-run markups. What is more

[7] The aggregate M/Y ratio is the output-weighted average of firm-level M/Y. Since the linear decomposition is in logs, we exponentiate the variables in the log-linear identity, take the output-weighted average, and then take logs.

interesting is the quantification. Expected markups account for 58% of the increase in aggregate valuations. This is partially offset by rising expected fixed costs and investments, such that markups net of fci account for one-third of the total rise in valuations. In line with our earlier observation from Table 2, expected markups are less cyclical than expected output growth, fci, and discount rates. VAR-implied markup expectations fall only modestly between the height of the dot-com bubble and the end of the Great Recession, compared to the fall in output growth and fci and the rise in discount rates.

The quantitative result may depend on our baseline assumption that all of SG&A expenses represent fixed costs. In a robustness test, we assign 70% of SG&A to variable costs following Eisfeldt et al. (2022). Figure C.3 shows the result. Given the rising trend in SG&A since the 1980s, this mechanically flattens the trends in both markups and fci and thus lowers their individual shares in the rise of the market value-to-output ratio; the markup share goes from 58% to 37%. But since fci and markup partially offset each other, the fall in their combined share is muted, from 32% in the baseline to around 20%. Discount rates and output growth each account for around 40% of the total rise in market value-to-output in this fixed-cost specification.

Given the concurrent rise in valuations and markup expectations, and the finding by De Loecker et al. (2020) that aggregate markups have risen predominantly due to a reallocation of market share to high-markup firms, we conduct a similar time-series decomposition of the output-weighted long-run markup expectations into (i) a within-firm component, (ii) a reallocation component, (iii) and entry component, and (iv) an exit component. For ease of notation, let $x = \sum_{\tau=1}^{\infty} \rho^{\tau-1} E_t \mu_{i,t+\tau}$. We can write Δx_t as

$$\Delta x_t = \underbrace{\sum_i w_{i,t-1}\Delta x_{i,t}}_{\Delta\text{within}} + \underbrace{\underbrace{\sum_i \Delta w_{i,t}\tilde{x}_{i,t-1}}_{\Delta\text{market share}} + \underbrace{\sum_i \Delta w_{i,t}\Delta x_{i,t}}_{\Delta\text{cross term}}}_{\Delta\text{reallocation}} +$$

$$\underbrace{\sum_{i\in\text{Entry}} w_{i,t}\tilde{x}_{i,t} - \sum_{i\in\text{Exit}} w_{i,t-1}\tilde{x}_{i,t-1}}_{\text{net entry}} \tag{16}$$

where $\tilde{x}_{i,t} = x_{i,t} - x_{t-1}$, $\tilde{x}_{i,t-1} = x_{i,t-1} - x_{t-1}$. Figure 4 plots this decomposition.

We observe that the aggregate rise in expected markups is driven by two components: 1) reallocation to high-expected markup firms and 2) a rise in within-firm markup expectations. Whereas result 1) is consistent with the findings by De Loecker et al. (2020) on realized markups, result 2) is not. In fact, De Loecker et al. (2020) find that the within-firm realized markup component has barely risen since 1980 and even fallen between 2000 and 2016. Our forward-looking, present-value measure shows an initial decline that then picks up substantially after the Great Recession. This result is indicative of market expectations that markups would rise for the average firm in the economy, consistent with a continued rise in "pure profits" (Barkai, 2020).[8]

Entry plays close to no role despite newly listed firms having higher-than-average markup expectations. The reason is that their output share in the aggregate is negligible. Exit only drives up aggregate markup expectations in the late 1990s and early 2000s. Delisting firms had lower-than-average markups, and many delistings occurred in the context of liquidation or bankruptcy. On the other hand, in the years 2015 through 2020, exiting firms had higher-than-average markup expectations. These exits were predominantly associated with mergers rather than liquidations

[8] An alternative interpretation is that markets expect the average firm to become higher-markup but also higher-fixed cost (and, presumably, more intangible-intensive). This explanation, however, counterfactually predicts a lower share of the total rise in expected markups attributable to the within-firm rise in the alternative fci specification that allocates 70% of SG&A expenses to variable, rather than fixed costs.

(71% of delistings between 2010 and 2020 involved mergers, compared to 56% between 1990 and 2009), which is reflected in the steep rise in the reallocation component, as the acquiring firm mechanically gains market share. We explore the impact of M&A on *within-firm* markup expectations in the next section.

3.4 Market Power and M&A

We collect merger events from SDC Platinum and combine them with our firm-level, VAR-implied markup expectations. For each acquirer-year observation, we identify all US-listed targets acquired in that year. For the five years preceding the merger, we compute the pre-merger output-weighted average of realized markups and VAR-implied markup expectations for target(s) and acquirer. We compare these observations with post-merger (realized and expected) markups for the combined firm in $t+1$ through $t+5$.

In a difference-in-differences setting, we compare changes in markups between merging and non-merging firm. We regress markups and markup expectations on an acquirer dummy interacted with a post-merger indicator,

$$x_{i,t} = a_i + a_t + b\mathbb{1}_i^{\text{merger}} \times \mathbb{1}_t^{\text{post}} + \varepsilon_{i,t} \tag{17}$$

where x_t is either the current markups, μ_t, or the VAR-implied long-run markup expectation, $\sum_{j=1}^{\infty} \rho^j \hat{\phi}_1 \hat{\mathbb{E}}_t \left[\mu_{t+j}\right]$. Table 4 reports the results. Long-run markup expectations exhibit a significant rise post-merger, but realized markups do not.

We then disaggregate the post-merger effect by year-since-merger. To this end, we regress markups and markup expectations on an acquirer dummy now interacted with an indicator for each year relative to the merger. Figure 5 plots the coefficients on these interactions. Consistent with the forward-looking nature of asset prices, markup expectations rise substantially in the year after merger completion. The initial jump reverts partially in $t+2$ but then remains stable and statistically significant from $t+3$ to $t+5$.

In comparison, realized markups observed year-by-year do not rise significantly until five years after the merger, although the point estimates rise almost monotonically over the post-merger years. This comparison highlights once again the strength of the present-value framework in translating the forward-looking information encoded in asset prices into the expectations of *long-run* markups that arguably drive merger decisions of acquirers and anti-trust considerations of regulators.

The reallocation component in Figure 4 suggests that market shares have gradually risen for firms with higher expected long-run markups. The results from this subsection show the importance of mergers and acquisitions for aggregate markups through a second channel. Mergers not only mechanically raise the market share of the combined firm, but are also associated with a rise in markup expectations for those combined firms. This shows up as a rise in within-firm markup expectations in (16).

4 Asset Returns and Expected Market Power

Following the decomposition of valuation levels, we now turn to returns. The present-value framework implies a decomposition of "return news" (i.e., unexpected returns) à la Campbell (1991) and Vuolteenaho (2002). Additionally, a growing literature in asset pricing has sought to link competition and market power to differences in risk premia (i.e., expected returns).[9] We address both dimensions of return variation in turn.

[9] See, e.g., Bustamante and Donangelo (2017); Barrot et al. (2019); Corhay et al. (2020); Corhay, Li, and Tong (2022); Grotteria (2023).

4.1 Sources of asset return shocks

To analyze the sources of unexpected asset return shocks or "news," we follow Campbell (1991) to transform the identity in (11) into the following news decomposition:

$$r_{i,t+1} - \mathbb{E}_t r_{i,t+1} \approx N_{\Delta y,i,t+1} + N_{\mu,i,t+1} - N_{fci,i,t+1} - N_{DR,i,t+1} \tag{18}$$

where the news terms are

$$N_{\Delta y,i,t+1} \equiv (\mathbb{E}_{t+1} - \mathbb{E}_t) \sum_{\tau=1}^{\infty} \rho^{\tau-1} \Delta y_{i,t+\tau}$$

$$N_{\mu,i,t+1} \equiv \phi_1 (\mathbb{E}_{t+1} - \mathbb{E}_t) \sum_{\tau=1}^{\infty} \rho^{\tau-1} \mu_{i,t+\tau}$$

$$N_{fci,i,t+1} \equiv \phi_2 (\mathbb{E}_{t+1} - \mathbb{E}_t) \sum_{\tau=1}^{\infty} \rho^{\tau-1} fci_{i,t+\tau}$$

$$N_{DR,i,t+1} \equiv (\mathbb{E}_{t+1} - \mathbb{E}_t) \sum_{\tau=0}^{\infty} \rho^{\tau} r_{i,t+\tau}.$$

A positive asset return shock today implies a combination of (i) positive news about expected output growth ($N_{\Delta y}$), (ii) positive news about expected markups (N_{μ}), (iii) news about lower expected future fixed costs and investments (N_{fci}), and (iv) news about lower future discount rates (N_{DR}). Like the expected discounted sums of infinite horizon variables, their news can be extracted directly from the VAR.

Table 5 reports their covariance matrix as well as their contribution to overall return news. All four terms are similarly volatile with annual standard deviations between 9% and 14%, which translate into contributions of around 22% (N_{DR}) to 42% ($N_{\Delta y}$) to total return-news variance. Overall, markup news contributes 38% to unexpected returns. Most of this contribution comes from cross-sectional variation. Within-firm variation in markup news is much less volatile and accounts for 2% of within-firm return news, confirming our earlier observation that markup expectations are smoother in the time series than other value components. Discount-rate news, on the other hand, is predominantly driven by the time series and accounts for 53% of within-firm return news.

All three cash-flow news components are negatively correlated with discount-rate news, that is, a rise in discount rates is associated with a fall in expected markups, expected output growth, and expected fixed costs and investments. These correlations are negative in the cross-section and the time series, but larger in magnitude in the time series for markups and fixed costs. The finding supports arguments that link the rise in market power and the fall in interest rates. For instance, Liu et al. (2022) argue that lower interest rates lead to an asymmetric investment response that favors large firms and increases concentration. Dou et al. (2021) argue that lower discount rates raise the benefits of long-term gains from collusion and generate market power in this way. Gutiérrez et al. (2021) argue instead that causation runs in reverse: Market power lowers investment incentives and thereby contributes to a fall in equilibrium interest rates. Our VAR results are consistent with all three mechanisms, but as we do not extract structural shocks, we cannot distinguish between the different channels.

The negative cross-sectional correlation between markup news and discount-rate news suggests that higher markups are, on average, associated with lower risk premia. However, markup news is also associated with news about other characteristics—higher expected output growth and higher fci—which may also be related to risk premia. Therefore, next, we turn to more targeted asset pricing tests to assess the empirical link between expected markups and expected returns.

4.2 Expected stock returns and expected future market power

We form quintile portfolios based on VAR-implied markup expectations. To avoid look-ahead bias, we estimate the VAR over the first half of our sample (1960-1990) and use the estimated coefficients to compute expected markups at the firm level over the second half (1990-2020). We then compute abnormal returns of the quintile portfolios sorted on expected markups relative to the five-factor model of Fama and French (2015). Therefore, the resulting alphas are net of exposures to market risk and risk premia related to size, book-to-market, profitability, and investment. Controlling for the latter three is particularly important in this context.[10]

Panel A of Figure 6 reports the results. The top quintile portfolio (highest expected markups) has significantly positive alphas of about 2% per year. The bottom quintile, instead, has significantly negative alphas of -2.6%. Alphas are also negative, but insignificant, for quintiles two and three and positive for quintile four. These results suggest that expectations of long-run markups are *positively* associated with risk premia in the cross-section.

For comparison, Panel B reports the alphas from a portfolio-sort exercise based on *realized* markups. There is substantial overlap in the composition of the top quintiles between expected and realized markups. Therefore, the top quintile portfolios have almost identical alphas. However, the rest of the distribution differs from that in Panel A. The point estimate for the alpha of the bottom quintile portfolio by realized markups is positive, and the alpha of a long-short portfolio based on realized markups is insignificantly different from zero.

Table 6 further reports the loadings of the markup-sorted portfolios on the five Fama-French factors. It is particularly interesting to note that the long-short portfolio sorted on VAR-implied long-run markups does *not* load positively on the profitability factor (RMW). That is, including expected markups into portfolio construction adds information about equity premia that is not captured by the standard profitability premium.

[10] Expected market power is a function of the VAR state variables and these include a valuation ratio (market value-to-output) and variables closely related to profitability (μ) and investment.

5 Discussion

A number of possible mechanisms connect asset prices, growth, discount rates, markups, and investments. Through the lens of our results, we discuss some key mechanisms proposed in the literature, organized around five themes.

Secular trends in discount rates and valuations *Ceteris paribus*, lower discount rates—the sum of risk-free rates and risk premia—imply higher valuations. Real and nominal risk-free rates have exhibited a secular decline since the 1980s (Summers, 2015; Bauer and Rudebusch, 2020; Hillenbrand, 2021). However, whether risk premia have fallen (Blanchard, Shiller, and Siegel, 1993; Jagannathan, McGrattan, and Scherbina, 2000; Lettau, Ludvigson, and Wachter, 2007; Avdis and Wachter, 2017; Bianchi, Lettau, and Ludvigson, 2022) or risen (Caballero and Farhi, 2018; Farhi and Gourio, 2018) lacks consensus in the literature, and the total fall in discount rates and its effect on asset prices, thus, remain unclear.

Our VAR decomposition quantifies the effect of discount rates on valuations. As illustrated in Figure 3, the long-horizon sum of aggregate discount rates, $\sum_{j=1}^{\infty} \rho^{t+j} \mathbb{E}_t r_{t+j}$, fell by approximately 0.5 from 1982 to 2020. Assuming constant discount rates, this sum simplifies to $r/(1-\rho)$. With ρ estimated at 0.98, this reduction suggests a 1 percentage point drop in r. For comparison, long-term nominal Treasury rates for 10-year and 30-year bonds have fallen by nearly 9 percentage points over the same period. While these 9 percentage points may reflect other forces, such as falling inflation or liquidity premia, in addition to a fall in the true risk-free rate, our results likely imply a compensatory rise in equity risk premia. Our estimated one-percentage-point decline in average discount rates is quantitatively similar to that of Farhi and Gourio (2018).

Firms' investment rates and stock returns Production-based asset pricing models link stock returns to marginal rates of transformation, inferred from data on corporate investments. The general conclusion is that firms with high current investment rates earn lower average stock returns (Cochrane, 1991, 1996; Gomes, Kogan, and Zhang, 2003; Zhang, 2005; Liu, Whited, and Zhang, 2009; Kogan and Papanikolaou, 2010; Clementi and Palazzo, 2019). The canonical model in this literature would have the following prediction. If stock prices rise, for instance because of lower discount rates, the price surge encourages firms to boost their investments.

Our VAR decomposition elucidates the link between investment and discount rates. Table 5 reveals that, both in the cross-section and in the time series, positive news about expected *fci* are linked to lower expected discount rates. Long-run investments and discount rates exhibit a negative correlation of about -45% in the panel and in the time series. In the cross-section, the correlation is around -20%. In all cases, qualitatively, our findings align with the standard predictions of production-based asset pricing models. Quantitatively, they provide a useful benchmark on the correlation between expected long-run investments and discount rates in the data.

Investments, markups, and valuations Standard Q-theory arguments predict a rise in investment in response to higher returns to capital and corporate valuations. Yet, there has been a shortfall in corporate investments, in notable contrast to the high valuations of companies (Alexander and Eberly, 2018; Gutiérrez and Philippon, 2017). Crouzet and Eberly (2023) find that the widening gap between corporate valuations and investments reflects an increasing gap between the average value of business capital (Tobin's average Q) and its marginal value (Tobin's marginal q), i.e., the shadow value driving investments. Both Crouzet and Eberly (2023) and Corhay et al. (2021) point to market power as a force that reduces investment incentives. Gutiérrez and Philippon (2017) attribute two-thirds of the 'investment gap'—the shortfall in measured investment relative to the Q-theory prediction—to rising concentration and governance issues arising from common ownership. They argue the remaining one-third of the gap reflects unmeasured investment in intangibles (see also Crouzet et al., 2022).

Our results show expected fci rises in lock-step with valuations. The fci variable aggregates capital expenditure and expenses often tied to the creation of intangible capital like R&D and SG&A (Eisfeldt and Papanikolaou, 2014), and its rise is predominantly driven by the intangible component, so this finding is consistent with the argument that mismeasured intangible investment accounts for part of the investment gap.[11]

We find that markup news is positively associated with fci-news. That is, shocks raising long-run markup expectations tend to coincide with shocks raising expected long-run fci. However, this relationship does not clarify the direction of causality. It may reflect the necessity for firms to continually invest, especially in intangible assets, to develop and sustain market power, as suggested by Crouzet and Eberly (2019) and De Ridder (2024).

Investments, markups, and productivity Our VAR decomposition can also shed light on whether, in our sample, investments in intangibles led to higher productivity, higher markups, or both. This is a key issue of debate (Syverson, 2019). On one hand, increased concentration is often linked to innovation, more capital investments, and higher productivity in situations involving heterogeneous-cost firms selling differentiated goods (Autor, Dorn, Katz, Patterson, and Van Reenen, 2017). On the other, a rise in concentration can be accompanied by higher market power and markups, as typically seen in standard Cournot oligopoly models. In an aggregate time series, De Loecker et al. (2020) find that the rise in realized markups is driven by increased concentration among high-markup firms. Figure 4 mirrors these results for expected markups.

As an example of how our present-value framework can help approach the question of efficient concentration versus excessive market power, consider Crouzet and Eberly's (2018) study of the retail sector. They find that, while concentration (as measured by HHI) has increased substantially

[11]It is notable that the non-capital expenditure portion of fci jumped from 17.4% of output in 1980 to 30.2% in 2020, contrasting with a decline in capital expenditures from 8.9% to 5.5% over the same period. This shift underscores the growing significance of intangible investments, which outweighed the drop in the capital expenditure-to-output ratio, and accounted for the overall increase in total fci.

since the mid-1990's, markups (as measured by De Loecker et al., 2020) have not. This finding has been interpreted as indicative that rising concentration in the retail sector reflects efficient reallocation towards more productive, intangibles-intensive firms. On the other hand, retail firms may only reap the market-power benefits from concentration and intangible investments with delay (Crouzet et al., 2022), and our VAR decomposition is uniquely positioned to answer the question with respect to forward-looking markup trajectories. Indeed, we observe that realized retail-markups do *not* rise between 1989 and 2015, but *expected, long-run* markups rise steadily between 1980 and 2020, consistent with the "delayed-benefit" explanation (Figure 7).[12] The years since 2015 corroborate this point: the average realized markup among retail firms in our sample rises almost twofold from 0.177 in 2015 to 0.281 by 2020.

While our decomposition does not feature productivity directly, Figure 7 shows that expectations of output growth and markups have risen by similar amounts between the early 1980s and 2020, indicating that the rise in concentration documented by Crouzet and Eberly (2018) has been associated with expectations of both productivity gains and markup expansion.

Output growth The secular-stagnation narrative predicts not only a decline in interest rates, but also a decline in output growth (e.g., Summers, 2015; Farhi and Gourio, 2018). In contrast to this narrative, our present-value decomposition indicates that expected output growth among the listed firms has *risen* in lockstep with the fall in discount rates. In fact, Figure 3 shows that our estimates for the discounted sum of expected output growth rates have risen by around 0.6 from the early 1980s to 2020, which implies an increase of around 1.2 percentage points in the expected output growth rate according to a back-of-the envelope calculation analogous to the one for discount rates.

[12]Following Crouzet and Eberly (2018), we include firms with 2-digit NAICS codes 44 and 45. The data requirements for the VAR unfortunately limit direct comparability; our sample contains 3476 firm-year observations between 1989 and 2015, compared to 6259 over the same time frame in Crouzet and Eberly (2018). These sample composition effects lead our sales-weighted average for realized markups to be more volatile between 1989 and 2015 than those in Crouzet and Eberly (2018) but we find a similar level and similarly small total change over that time frame (from $\mu = 0.160$ to 0.177 in 2015).

What are some potential explanations? One is that the listed firms do not represent the overall economy and that their realized output growth may be uninformative about general economic trends. An alternative explanation is that long-run growth expectations have been disconnected from the lackluster short-run realizations. Our findings support the second explanation. Indeed, since 1982, realized output growth for the firms in our sample has fluctuated without any specific trend around an average value of 4.7%. If indeed the higher long-run expectations are borne out by the future, the temporary decoupling may just reflect a change in production technology toward intangible capital. This could arise from both the “missing" intangible investment understating measured TFP growth (Brynjolfsson, Rock, and Syverson, 2021) and the potential delay in productivity realization owing to ‘time-to-build’ impeding short-run realized output growth (Greenwood and Jovanovic, 1999; Crouzet et al., 2022).

6 Conclusion

We derive a present-value identity in the spirit of Campbell and Shiller (1988) that linearly decomposes firm-level market value relative to output into long-run expectations about future (i) output growth, (ii) markups, (iii) fixed costs and investments, and (iv) discount rates. The present-value framework allows us to study the empirical relationships of secular trends in these variables in a holistic and model-free way.

We find that approximately one-third of the increase in the total market value of U.S. public companies between 1982 and 2020 can be attributed to the growth in expected future markups net of fixed costs and investments. Additionally, lower discount rates and higher expected long-run output growth each contribute roughly one-third to this rise. The upward trend in average markup expectations is driven by both a reallocation of market share towards firms with higher expected markups, and a within-firm rise in expected markups. We document the role of M&A in the within-firm rise in expected markups using a dynamic difference-in-differences approach.

Finally, we show that, in the time series, shocks to expected markups are negatively associated with discount rate shocks, while, in the cross-section, firms with higher markup expectations earn higher stock returns after controlling for risk factors commonly employed in the literature.

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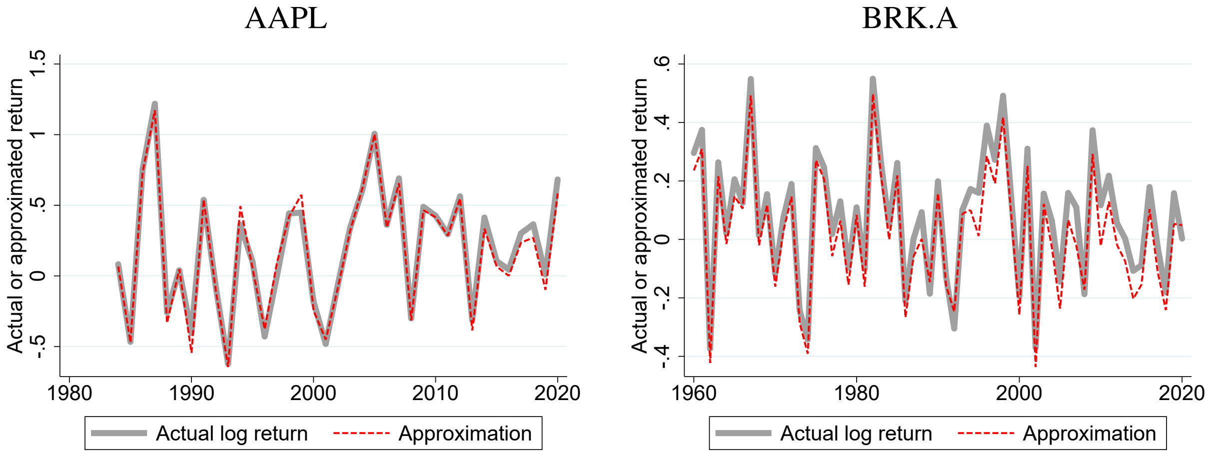
Figure 1: Approximate identity (firm-level fit)

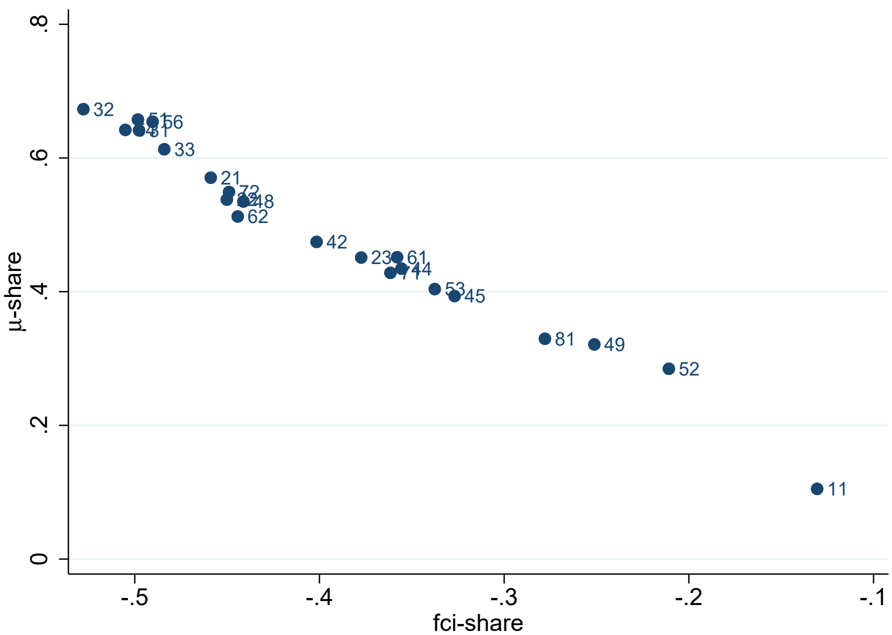


Notes: The two figures plot the realized returns of Apple Inc. and Berkshire Hathaway Inc., $r_{i,t}$, against the respective corresponding returns obtained from the approximate identity (9):

$$r_{i,t}^{approx} = (\rho - 1)m_{i,t} - m_{i,t-1} + \Delta y_{i,t} + \phi_1 \mu_{i,t} + \phi_2 fci_{i,t}.$$

The figures help visualize the tightness of our approximate present-value identity.

Figure 2: Markup- and fci shares in intra-industry price-to-output variation

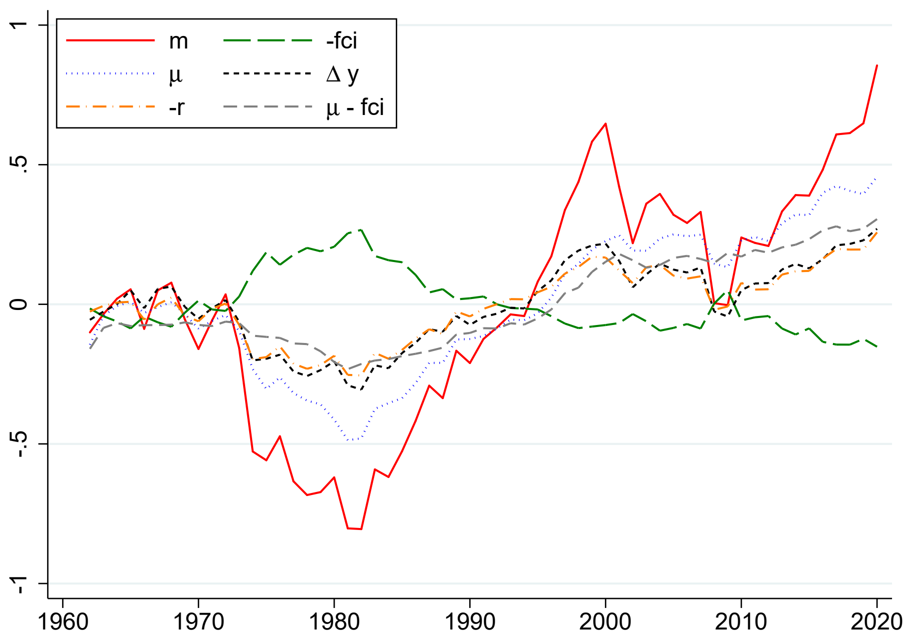


Notes: This figure plots the shares of VAR-implied, long-run fci- and μ-expectations in intra-industry variation in price-to-output ratios. The decomposition follows Equation (13), which we estimate via the following industry-level regression:

$$\sum_{j=1}^{\infty} \rho^{j} \mathbb{E}_t \left[x_{i,t+j}\right] = a_{k,t} + b_k \times m_{i,t} + \varepsilon_{i,t}$$

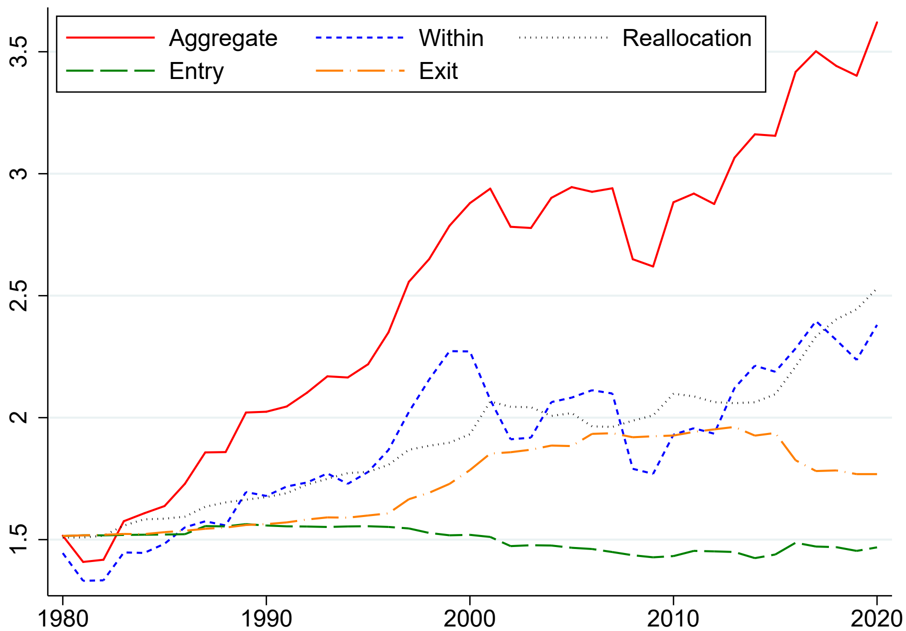
for $x_{i,t} = \{\phi_1 \mu_{i,t}, \phi_2 fci_{i,t}\}$. We plot b_k with markers indicating industry k by its two-digit NAICS code. We omit NAICS code 99 (non-classifiable establishments).

Figure 3: Decomposition of aggregate market value-to-output over time



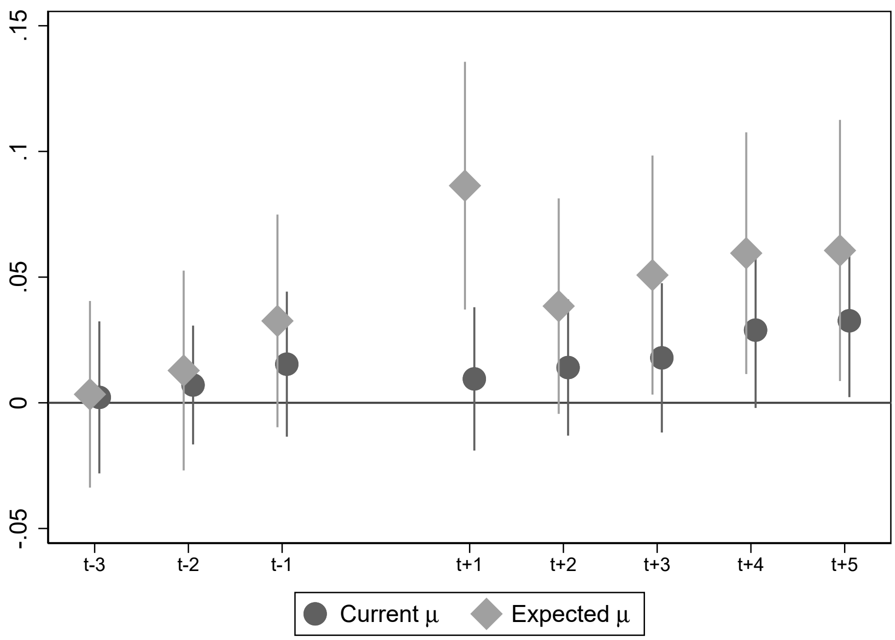
Notes: This figure plots the aggregate log value to output ratio and its VAR-implied decomposition into expected markups, output growth, discount rates, and fci. We aggregate by exponentiating the firm-level components of the log-linear identity, compute an output-weighted average, and then take logs. We de-mean each time-series for readability.

Figure 4: Drivers of aggregate expected markups over time



Notes: This figure plots the decomposition following Equation (16) for the aggregate time-series of expected log markups. We aggregate across firms by computing an output-weighted average of the exponentiated long-run sums of VAR-implied future markups.

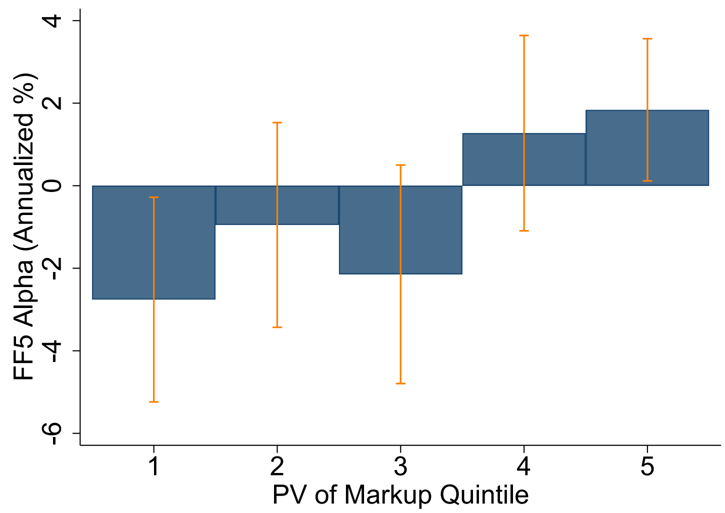
Figure 5: M&A and markup expectations



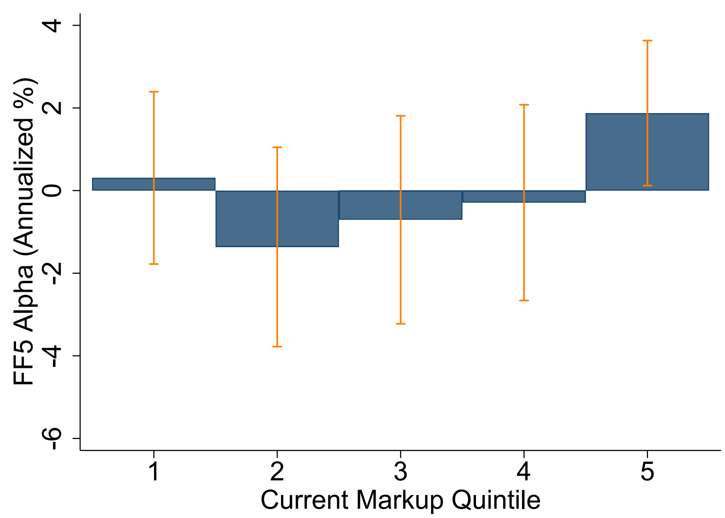
Notes: This figure plots the difference-in-differences estimates in markup expectations around merger events. 95-% confidence intervals are constructed from double-clustered standard errors at the firm and year level. Mergers are completed in year *t* and we compare VAR-implied markup expectations target and acquirer firms with non-merging firms.

Figure 6: Five-factor alphas of markup-sorted portfolios

Panel A: Quintiles by VAR-implied long-run markup expectations

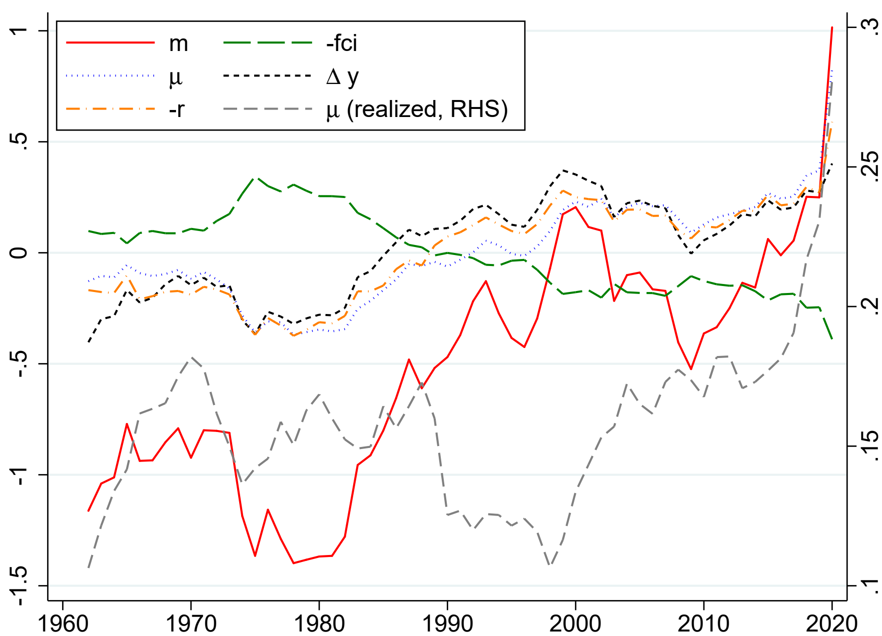


Panel B: Quintiles by current markup (μ)



Notes: This figure plots the five-factor (Fama and French, 2015) alphas of quintile portfolios sorted on expected markups (Panel A) and current markups (Panel B). Alphas are estimated between 1990 and 2020, and markup expectations based on a VAR matrix estimated from 1960-1990.

Figure 7: Decomposition of the retail-sector's market value-to-output over time



Notes: This figure plots the log value to output ratio for the retail sector (NAICS codes 44 and 45) and its VAR-implied components relating to expected future markups and fci. We aggregate by exponentiating the firm-level components of the log-linear identity, then computing an output-weighted average before taking logs and de-meaning for readability. The gray, dashed line plots the output-weighted average realized year-by-year markup on the right-hand side axis.

Table 1: **Baseline VAR: Coefficient matrix B.**

	r_{t-1}	Δy_{t-1}	fci_{t-1}	m_{t-1}	μ_{t-1}	lev_{t-1}	$capex_{t-1}$	ag_{t-1}	ms_{t-1}	Intercept	R^2
r_t	-0.057	-0.017	0.012	-0.040	0.035	-0.045	-0.228	-0.081	-0.005	0.129	0.036
	(0.059)	(0.060)	(0.019)	(0.015)	(0.029)	(0.066)	(0.214)	(0.020)	(0.027)	(0.043)	
Δy_t	0.069	0.184	0.018	0.026	-0.030	-0.015	0.265	0.032	-0.034	0.080	0.159
	(0.024)	(0.040)	(0.007)	(0.006)	(0.014)	(0.023)	(0.056)	(0.032)	(0.009)	(0.016)	
fci_t	-0.089	-0.197	0.699	0.059	0.251	-0.029	0.166	-0.072	-0.037	-0.449	0.753
	(0.050)	(0.056)	(0.026)	(0.012)	(0.041)	(0.052)	(0.212)	(0.046)	(0.041)	(0.049)	
m_t	-0.115	-0.131	0.007	0.938	0.049	-0.016	-0.367	-0.109	0.025	0.041	0.907
	(0.055)	(0.059)	(0.016)	(0.017)	(0.031)	(0.063)	(0.266)	(0.040)	(0.030)	(0.048)	
μ_t	-0.020	-0.023	-0.006	0.028	0.950	0.002	0.260	-0.016	0.002	-0.003	0.938
	(0.047)	(0.013)	(0.013)	(0.010)	(0.010)	(0.010)	(0.221)	(0.009)	(0.011)	(0.024)	
lev_t	-0.005	-0.006	0.008	-0.005	-0.005	0.891	0.032	0.002	0.005	0.037	0.844
	(0.012)	(0.006)	(0.005)	(0.003)	(0.007)	(0.049)	(0.056)	(0.005)	(0.005)	(0.014)	
$capex_t$	0.004	0.048	-0.001	0.011	-0.015	-0.015	0.616	-0.017	0.006	0.018	0.459
	(0.004)	(0.013)	(0.003)	(0.007)	(0.009)	(0.006)	(0.045)	(0.011)	(0.014)	(0.007)	
ag_t	0.050	0.195	-0.028	0.029	0.037	0.250	0.244	-0.001	-0.062	-0.039	0.056
	(0.032)	(0.026)	(0.016)	(0.009)	(0.036)	(0.247)	(0.120)	(0.014)	(0.025)	(0.068)	
ms_t	0.018	0.010	0.002	0.001	0.002	0.004	-0.055	0.003	0.987	-0.002	0.984
	(0.014)	(0.004)	(0.002)	(0.003)	(0.005)	(0.005)	(0.034)	(0.003)	(0.011)	(0.002)	

Notes: The table reports the parameter estimates for the baseline VAR. The state vector is $z_{i,t} = [r_{i,t}, \Delta y_{i,t}, \mu_{i,t}, fci_{i,t}, m_{i,t}, lev_{i,t}, capex_{i,t}, ag_{i,t}, ms_{i,t}]$, denoting, respectively, the firm's weighted average return, output growth, markup, fixed cost and investment scaled by sales, leverage $\log(1+Z_{i,t}/A_t)$, net capex over assets $\log\left(1+\frac{capx_{i,t}-dep_{i,t}}{A_{i,t-1}}\right)$, asset growth $\log(A_{i,t}/A_{i,t-1})$, and market share (firm sales relative to industry sales). For each coefficient estimate, we report standard errors in parentheses, double-clustered at the year-firm level. Data are from 1960 through 2020.

Table 2: **Variance decomposition of the valuation ratio**

	$\sum_{j=1}^{\infty} \rho^j \hat{\mathbb{E}}_t \left[x_{t+j}\right]$			
	r	$\hat{\phi}_1 \mu$	Δy	$\hat{\phi}_2 fci$
Panel A: Panel variation (no fixed effects)				
m_t	0.279	0.634	0.471	-0.492
	(0.009)	(0.022)	(0.013)	(0.015)
Panel B: Cross-sectional variation (year fixed effects)				
m_t	0.271	0.642	0.483	-0.499
	(0.010)	(0.028)	(0.012)	(0.018)
Panel C: Intra-industry variation (industry-year fixed effects)				
m_t	0.246	0.634	0.515	-0.495
	(0.010)	(0.028)	(0.011)	(0.020)
Panel D: Time-series variation (firm fixed effects)				
m_t	0.355	0.447	0.442	-0.350
	(0.016)	(0.043)	(0.010)	(0.032)

Notes: The table decomposes the variance of firms' market value-to-output ratios into long-run expected returns and long-run expected cash flows, made up of markups (μ), output growth (Δy), and fixed costs/investment (fci), as implied by the VAR model of Equation (B.1). We estimate the following equations:

$$\sum_{j=1}^{\infty} \rho^j \mathbb{E}_t \left[x_{i,t+j}\right] = a_f + b \times m_{i,t} + \varepsilon_{i,t}$$

where fixed effects are $f = t$ in Panel B and $f = i$ in Panel D. The discount coefficient (ρ) equals 0.98. The slope coefficients approximately sum up to one, up to the cumulative approximation error. Standard errors (in parentheses) are double-clustered at the year and firm level. Data are from 1960 through 2020.

Table 3: **Decomposition of expected future markups**

Bootstrap percentile	1	5	10	25	50	75	90	95	99
				Panel A: $\sum_{\tau=h}^{H} \rho^{\tau-1} E_t \mu_{i,t+\tau}$ from $h=1$ to $H=\infty$					
μ	53.9	54.22	54.39	54.69	55.04	55.39	55.69	55.88	56.19
m	43.14	43.46	43.64	43.94	44.28	44.63	44.92	45.1	45.43
				Panel B: $\sum_{\tau=h}^{H} \rho^{\tau-1} E_t \mu_{i,t+\tau}$ from $h=1$ to $H=5$					
μ	91.93	92.12	92.24	92.42	92.63	92.84	93.03	93.14	93.37
m	6.15	6.38	6.5	6.68	6.88	7.09	7.26	7.38	7.57
				Panel C: $\sum_{\tau=h}^{H} \rho^{\tau-1} E_t \mu_{i,t+\tau}$ from $h=1$ to $H=15$					
μ	75.13	75.46	75.64	75.95	76.28	76.64	76.93	77.13	77.49
m	22.02	22.38	22.57	22.85	23.21	23.55	23.85	24.03	24.36
				Panel D: $\sum_{\tau=h}^{H} \rho^{\tau-1} E_t \mu_{i,t+\tau}$ from $h=6$ to $H=\infty$					
μ	44.32	44.64	44.8	45.08	45.42	45.74	46.03	46.23	46.55
m	52.68	52.96	53.14	53.42	53.75	54.08	54.36	54.52	54.85
				Panel E: $\sum_{\tau=h}^{H} \rho^{\tau-1} E_t \mu_{i,t+\tau}$ from $h=16$ to $H=\infty$					
μ	36.75	37.05	37.19	37.47	37.8	38.11	38.39	38.58	38.88
m	59.95	60.26	60.42	60.7	61.01	61.32	61.59	61.76	62.06

Notes: The table presents the contribution of current markups (μ) and current market value-to-output ratio (*m*) for firms' long-run expected markups future markups ($\sum_{\tau=h}^{H} \rho^{\tau-1} E_t \mu_{i,t+\tau}$) over different horizons, $h \to H$. The discount coefficient (ρ) equals 0.98. Data are from 1960 through 2020. The percentiles are computed using non-parametric bootstrap.

Table 4: **M&A, markups, and markup expectations**

	μ_t	$\sum_{j=1}^{\infty} \rho^j \hat{\phi}_1 \hat{\mathbb{E}}_t \left[\mu_{t+j}\right]$
Treated × Post	0.014	0.061
	(0.010)	(0.015)
Observations	83504	83504

Notes: The table reports estimates from the following difference-in-differences specification:

$$x_{i,t} = a_i + a_t + b \mathbb{1}_i^{\text{merger}} \times \mathbb{1}_t^{\text{post}} + \varepsilon_{i,t}$$

where x_t is the current markup, μ_t, and VAR-implied markup expectation, $\sum_{j=1}^{\infty} \rho^j \hat{\phi}_1 \hat{\mathbb{E}}_t [\mu_{t+j}]$. Treated firms are those involved in a merger and we include observations of their outcome variables from $t-5$ to $t+5$, where the pre-merger variables are computed as the output-weighted average of target(s) and acquirer. The panel includes 628 acquirers in mergers closing between 1980 and 2020 and 7840 different non-merging firms in the years $t-5$ to $t+5$ around these merger events. Standard errors (in parentheses) are double-clustered at the year and firm level.

Table 5: **Variance decomposition of return news**

	σ (diag), ρ (off-diag)				Contribution to $\sigma^2_{N_r}$			
	N_{DR}	N_μ	$N_{\Delta y}$	N_{fci}	$-N_{DR}$	N_μ	$N_{\Delta y}$	$-N_{fci}$
				Panel A: Panel variation				
N_{DR}	0.097				0.217			
N_μ	-0.421	0.128			0.243	0.382		
$N_{\Delta y}$	-0.396	0.245	0.135		0.240	0.197	0.423	
N_{fci}	-0.456	0.935	0.280	0.099	-0.203	-0.553	-0.174	0.229
				Panel B: Cross-sectional variation				
N_{DR}	0.058				0.103			
N_μ	-0.153	0.122			0.067	0.460		
$N_{\Delta y}$	-0.445	0.399	0.132		0.209	0.396	0.534	
N_{fci}	-0.196	0.935	0.422	0.093	-0.065	-0.652	-0.317	0.264
				Panel C: Time-series variation				
N_{DR}	0.157				0.526			
N_μ	-0.492	0.031			0.103	0.021		
$N_{\Delta y}$	-0.256	0.004	0.115		0.198	0.001	0.285	
N_{fci}	-0.446	0.750	0.082	0.037	-0.111	-0.037	-0.015	0.030

Notes: This table reports the decomposition of return news following Campbell (1991). Alongside the familiar discount-rate news, cash-flow news split into news about future markups (N_μ), future output growth ($N_{\Delta y}$), and future fixed costs (N_{fci}). Panels B and C report these decompositions for cross-sectional and time-series variation, respectively, by adding year and, respectively, firm fixed effects to the VAR.

Table 6: **Factor loadings and alphas of portfolios sorted on expected future markup**

	Low	2	3	4	High
α	-0.028	-0.010	-0.021	0.013	0.018
	0.013	0.013	0.014	0.012	0.009
Market	-0.048	-0.108	0.102	0.051	-0.034
	0.028	0.031	0.036	0.030	0.018
SMB	0.170	0.030	0.007	-0.050	-0.193
	0.046	0.039	0.058	0.043	0.031
HML	0.134	0.159	0.127	-0.176	-0.299
	0.051	0.051	0.058	0.049	0.033
RMW	0.266	0.267	0.316	0.276	0.001
	0.058	0.056	0.061	0.052	0.050
CMA	0.079	-0.044	0.051	0.136	0.176
	0.070	0.077	0.089	0.082	0.057

Notes: This table reports the returns of quintile portfolios sorted on VAR-implied expected markups assessed against the five-factor model of Fama and French (2015). We report annualized alphas in the first row and standard errors in parentheses throughout. To obtain VAR-implied long-run markup expectations without introducing look-ahead bias, we estimate the VAR matrix over the first half of the sample (1960-1990) and then construct markup expectations and portfolio sorts for the second half.

Online Appendix

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A Derivation

Rewrite the markup expression in (5) as $VC_{i,t} = \frac{\theta_{i,t}}{\exp(\mu_{i,t})} Y_{i,t}$ and plug it into equation (4) to get

$$1 + R_{i,t} = \frac{M_{i,t}}{M_{i,t-1}} \left(1 + \frac{Y_{i,t} - \theta_{i,t} \exp(-\mu_{i,t}) Y_{i,t} - FCI_{i,t}}{M_{i,t}} \right).$$

Multiplying and dividing the right-hand side by $Y_{i,t}/Y_{i,t+1}$,

$$1 + R_{i,t} = \frac{M_{i,t}/Y_{i,t}}{M_{i,t-1}/Y_{i,t-1}} \frac{Y_{i,t}}{Y_{i,t-1}} \left(1 + \frac{Y_{i,t} - \theta_{i,t} \exp(-\mu_{i,t}) Y_{i,t} - FCI_{i,t}}{M_{i,t}} \right).$$

Taking a log on both sides,

$$r_{i,t} = m_{i,t} - m_{i,t-1} + \Delta y_{i,t} + \widetilde{s}_{i,t}$$

where

$$\widetilde{s}_{i,t} \quad = \quad \log\left(1 + \exp(-m_{i,t})\left(1 - \theta_{i,t} \exp(-\mu_{i,t}) - fci_{i,t}\right)\right)$$

Approximating $\widetilde{s}_{i,t}$ around $(m_{i,t}, \theta_{i,t}, \mu_{i,t}, fci_{i,t}) = \left(\overline{m}, \overline{\theta}, \overline{\mu}, \overline{fci}\right)$, we get

$$\widetilde{s}_{i,t} = \underbrace{\phi_0 - (1-\rho) m_{i,t} + \phi_1 \mu_{i,t} - \phi_2 fci_{i,t}}_{\equiv s_{i,t}} + \varepsilon_{i,t},$$

where

$$\phi_0 = \log\left(1 + \exp(-\overline{m})\left(1 - \overline{\theta}\exp(-\overline{\mu}) - \overline{fci}\right)\right) + \frac{\exp(-\overline{m})\left[\overline{m} + \overline{fci} - \overline{m}\,\overline{fci} + \exp(-\overline{\mu})\overline{\theta}\left(1 - \overline{m} - \overline{\mu}\right)\right]}{1 + \exp(-\overline{m})\left(1 - \overline{\theta}\exp(-\overline{\mu}) - \overline{fci}\right)}$$

$$\rho = \frac{1}{1 + \exp(-\overline{m})(1 - \overline{\theta}\exp(-\overline{\mu}) - \overline{fci})}$$

$$\phi_1 = \frac{\exp(-\overline{m})\exp(-\overline{\mu})\overline{\theta}}{1+\exp(-\overline{m})(1-\overline{\theta}\exp(-\overline{\mu})-\overline{fci})}$$

$$\phi_2 = \frac{\exp(-\overline{m})\overline{fci}}{1+\exp(-\overline{m})(1-\overline{\theta}\exp(-\overline{\mu})-\overline{fci})}$$

$$\varepsilon_{i,t} = -\frac{\exp(-\overline{m})\exp(-\overline{\mu})}{1+\exp(-\overline{m})(1-\overline{\theta}\exp(-\overline{\mu})-\overline{fci})}(\theta_{i,t}-\overline{\theta})$$

We put the effect of $\theta_{i,t}-\overline{\theta}$ in the approximation error; that is, if the output elasticity of variable input, θ, differs across time and industries, this would create an additional approximation error when using s_t to proxy for $\widetilde{s_t}$. To see why ρ corresponds to the Campbell and Shiller (1988) coefficient of around 0.96–0.98, it suffices to show that the second term in the denominator of ρ is analogous to the long-run dividend-price ratio in Campbell and Shiller. To see this, recognize that

$$\exp(-m_{i,t})(1-\theta_{i,t}\exp(-\mu_{i,t})-fci_{i,t}) = \frac{Y_{i,t}-VC_{i,t}-FCI_{i,t}}{M_{i,t}} = \frac{D_{i,t}-ISS_{i,t}}{M_{i,t}},$$

which shows that the term is analogous to the dividend-price ratio of a conventional stock but applies to a firm-level analysis. ρ captures the long-run average of the ratio of $M_{i,t}$ to $M_{i,t}+D_{i,t}-ISS_{i,t}$.

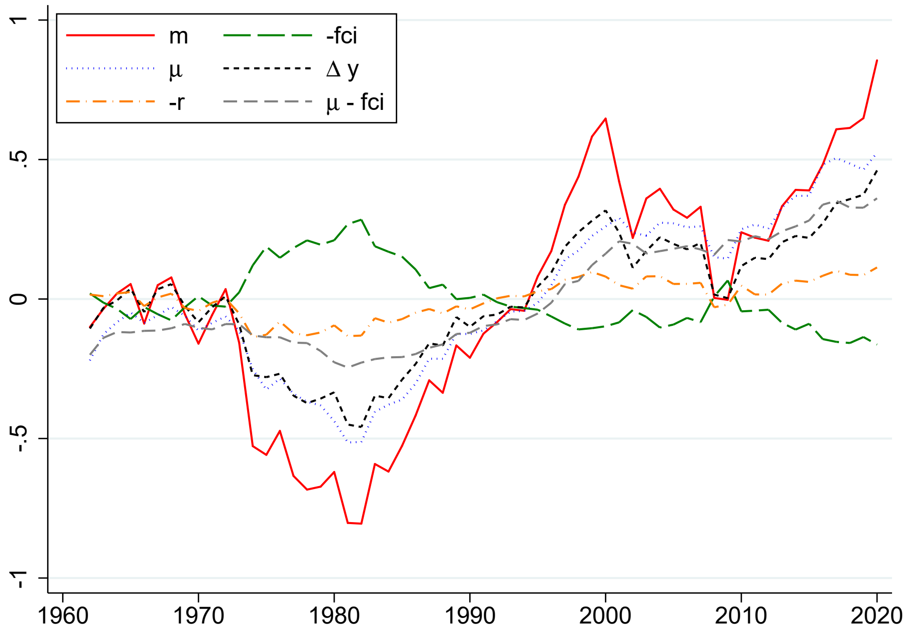
B Parsimonious VAR

This Appendix reports our main results for an alternative, more parsimonious VAR specification. In the results below, the VAR is limited to the state variables that show up in the loglinear identity (1) and omits the additional state variables featured in the baseline VAR. That is,

$$z_{i,t+1} = a + Bz_{i,t} + u_{i,t+1}, \tag{B.1}$$

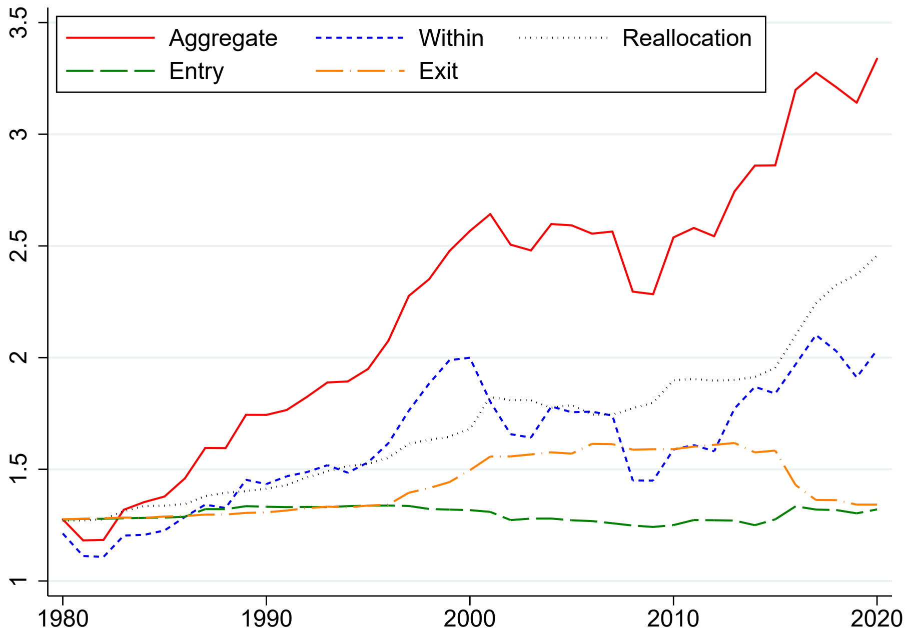
where $z_{i,t}$ contains only $[r_{i,t}, \Delta y_{i,t}, \mu_{i,t}, fci_{i,t}, m_{i,t}]$. The results are comparable to those in the main text. The most prominent difference is that, without leverage as a state variable, returns are less predictable and the discount-rate component in the decomposition is (even) lower than in the baseline specification, while the output-growth component rises.

Figure B.1: Parsimonious VAR: Decomposition of aggregate market value-to-output over time



Notes: This figure plots the aggregate log value to output ratio and its decomposition into expected markups, output growth, discount rates, and fci implied by the parsimonious VAR without extra state variables. We aggregate by exponentiating the firm-level components of the log-linear identity, compute an output-weighted average, and then take logs. We de-mean each time-series for readability.

Figure B.2: Drivers of aggregate expected markups over time



Notes: This figure plots the decomposition following Equation (16) for the aggregate time-series of expected log markups implied by the parsimonious VAR. We aggregate across firms by computing an output-weighted average of the exponentiated long-run sums of VAR-implied future markups.

Table B.1: **Parsimonious VAR: Coefficient matrix B.**

	r_{t-1}	Δy_{t-1}	fci_{t-1}	m_{t-1}	μ_{t-1}	Intercept	R^2
r_t	-0.046	0.049	-0.003	-0.037	0.059	0.058	0.019
	(0.056)	(0.094)	(0.014)	(0.013)	(0.012)	(0.027)	
Δy_t	0.085	0.214	0.029	0.030	-0.046	0.104	0.163
	(0.027)	(0.025)	(0.006)	(0.006)	(0.014)	(0.012)	
fci_t	-0.081	-0.098	0.699	0.055	0.269	-0.487	0.754
	(0.049)	(0.087)	(0.024)	(0.012)	(0.040)	(0.049)	
m_t	-0.118	-0.084	-0.015	0.935	0.087	-0.040	0.902
	(0.053)	(0.098)	(0.013)	(0.016)	(0.020)	(0.035)	
μ_t	-0.017	-0.020	0.001	0.028	0.944	0.015	0.937
	(0.044)	(0.015)	(0.008)	(0.011)	(0.008)	(0.011)	

Notes: The table reports the parameter estimates for the parsimonious VAR. The state vector is $z_{i,t} = [r_{i,t}, \Delta y_{i,t}, \mu_{i,t}, fci_{i,t}, m_{i,t}]$, denoting, respectively, the firm's weighted average return, output growth, markup, fixed cost and investment scaled by sales. For each coefficient estimate, we report standard errors in parentheses, double-clustered at the year-firm level. Data are from 1960 through 2020.

Table B.2: **Parsimonious VAR: Variance decomposition of the valuation ratio**

	$\sum_{j=1}^{\infty} \rho^j \hat{\mathbb{E}}_t \left[x_{t+j}\right]$			
	r	$\hat{\phi}_1 \mu$	Δy	$\hat{\phi}_2 fci$
Panel A: Panel variation (no fixed effects)				
m_t	0.122	0.658	0.628	-0.543
	(0.009)	(0.022)	(0.005)	(0.016)
Panel B: Cross-sectional variation (year fixed effects)				
m_t	0.118	0.666	0.635	-0.551
	(0.011)	(0.027)	(0.006)	(0.019)
Panel C: Intra-industry variation (industry-year fixed effects)				
m_t	0.114	0.674	0.636	-0.554
	(0.013)	(0.029)	(0.008)	(0.022)
Panel D: Time-series variation (firm fixed effects)				
m_t	0.214	0.457	0.570	-0.385
	(0.022)	(0.051)	(0.013)	(0.039)

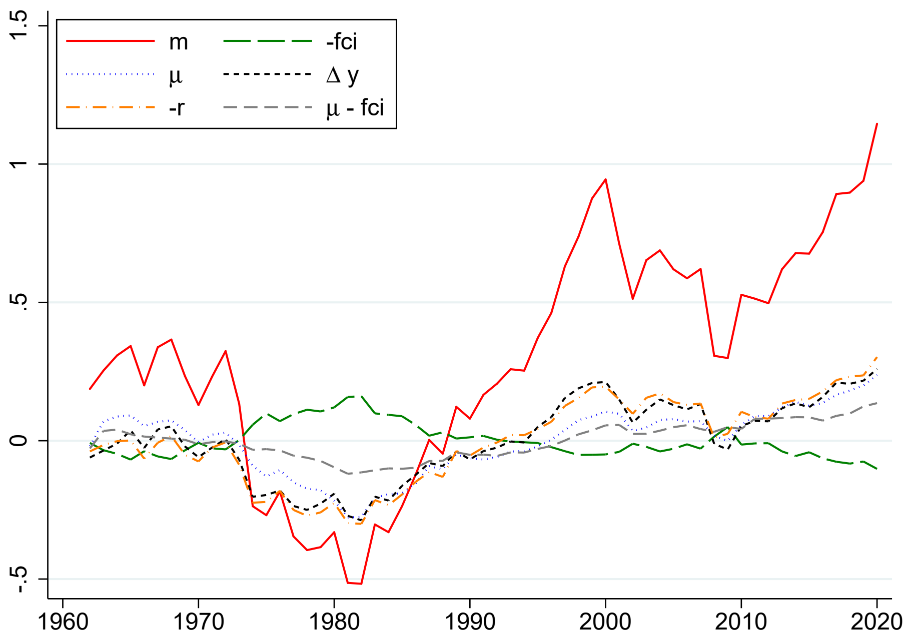
Notes: The table decomposes the variance of firms' market value-to-output ratios into long-run expected returns and long-run expected cash flows, made up of markups (μ), output growth (Δy), and fixed costs/investment (fci), as implied by the parsimonious VAR model without additional state variables. We estimate the following equations:

$$\sum_{j=1}^{\infty} \rho^j \mathbb{E}_t \left[x_{i,t+j}\right] = a_f + b \times m_{i,t} + \varepsilon_{i,t}$$

where fixed effects are $f = t$ in Panel B and $f = i$ in Panel D. The discount coefficient (ρ) equals 0.98. The slope coefficients approximately sum up to one, up to the cumulative approximation error. Standard errors (in parentheses) are double-clustered at the year and firm level. Data are from 1960 through 2020.

C Supplementary Figures and Tables

Figure C.3: Decomposition of aggregate market value-to-output over time (Alternative FCI)



Notes: This figure plots the aggregate log value to output ratio and its decomposition into expected markups, output growth, discount rates, and fci implied by the baseline VAR, but computing μ and fci under the assumption, following Eisfeldt et al. (2022) that only 30% of SG&A expenses are constitute costs, with the remainder assigned to variable costs. We aggregate by exponentiating the firm-level components of the log-linear identity, compute an output-weighted average, and then take logs. We de-mean each time-series for readability.