The Size Premium in a Granular Economy*

Logan P. Emery† Rotterdam School of Management Erasmus University Rotterdam

Joren Koëter† Rotterdam School of Management Erasmus University Rotterdam

January 2024

Abstract

The distribution of market capitalization in the U.S. is highly concentrated. We investigate how this phenomenon impacts the difference in returns between small and large firms (i.e., the size premium). If the stock market is sufficiently concentrated (i.e., granular), large firms may carry a risk premium because their idiosyncratic risk is not diversified in the market portfolio. At the same time, prior work has shown that small firms may be allocated too little capital in concentrated stock markets, which could increase their expected returns. We find that the expected size premium increases by 13.33 percentage points per annum during periods of higher concentration, indicating that the capital allocation effect dominates. Evidence from a variety of tests on investor attention, equity financing, fundamental volatility, and capital intensity support this conclusion. Nonetheless, we also find evidence of an active granular diversification effect, as the size premium weakens following idiosyncratic increases in granularity.

Keywords: Granularity, Size Premium, Concentration, Asset Pricing
JEL Classification: G11, G12, G14, G17

*We thank Dion Bongaerts, Joost Driessen, Ahmed Geucioueur, Giorgia Simion, Mathijs van Dijk, and seminar participants at Erasmus University Rotterdam, Robeco, and the Venice Finance Workshop for helpful comments. We are responsible for any remaining errors.

†Rotterdam School of Management, Erasmus University Rotterdam, Burgemeester Oudlaan 50, 3062 PA Rotterdam, The Netherlands. Emails: emery@rsm.nl, koeter@rsm.nl.

1 Introduction

Market concentration has substantially increased in recent decades (Grullon et al., 2019; Autor et al., 2020), and a literature has emerged studying the effects of this phenomenon.[1] While these studies have focused on the effects of increasing *product* market concentration, this phenomenon also suggests that *stock* market concentration will increase due to the role of fundamentals in determining asset prices. In a separate literature, Gabaix (2011) calls attention to the fact that significant concentration (i.e., granularity) implies that idiosyncratic shocks to the largest firms are not fully diversified in aggregate. This fact contradicts one of the core assumptions of modern asset pricing theory, namely that idiosyncratic risk is diversified in the market portfolio. Given that increasing concentration appears to be a defining characteristic of the modern economy, we study the asset pricing implications of stock market concentration.

Specifically, we investigate how stock market concentration affects the size premium. First documented by Banz (1981), the size premium refers to the fact that firms with relatively low market capitalization tend to earn higher stock returns compared to firms with relatively high market capitalization.[2] The characteristics of a granular economy may have important implications for the size premium. If the idiosyncratic risk of the largest firms is not diversified in aggregate, then investors should require a premium to hold those stocks, which increases the expected returns of large firms. This granular diversification effect suggests that higher stock market concentration should decrease the expected size premium.

Stock market concentration, however, may also carry with it other effects. Bae et al. (2021) find that stock market concentration is associated with less efficient capital allocation. They show that countries with concentrated stock markets have sluggish IPO activity,

[1] These effects include increased markups (De Loecker et al., 2020), decreased investment (Covarrubias et al., 2020), increased patent concentration (Akcigit and Ates, 2023), decreased labor share of income (Barkai, 2020), increased firm productivity (Kwon et al., 2023), and lower firm entry rates (Decker et al., 2016).

[2] The size premium has continued to garner interest from researchers, with recent studies focusing on explaining variation in the size premium across different sample periods (McLean and Pontiff, 2016; Asness et al., 2018; Hou and van Dijk, 2019).

produce less innovation, and have lower long-term economic growth. If stock market concentration implies that too little capital is allocated to small firms, the decreased demand for the equity of small firms would imply a higher cost of equity. Thus, small firms would need to adopt riskier projects to meet the higher required rate of return, therefore increasing expected returns. This capital allocation effect suggests that higher stock market concentration should increase the expected size premium.

Given the opposite predictions of the granular diversification and capital allocation effects, our analysis focuses on determining which effect dominates the relation between stock market concentration and the size premium. We begin by assessing the level of stock market concentration in the U.S. Concentration tends to increase during poor economic conditions and has increased substantially in recent decades. For example, the 20 largest firms represented 19.7% of total market capitalization in 1995 and 33.0% of total market capitalization in 2021. We also show that the stock market is sufficiently concentrated to generate granular effects. Using a simple modeling framework, we estimate that idiosyncratic variance accounts for between 4.5% and 14.8% of market variance, which suggests that granular effects are nontrivial.

In our simple model, the Herfindhal-Hirschmann Index of market weights emerges as the scaling factor for the size of idiosyncratic variance within the market portfolio. We therefore measure stock market concentration with this quantity and use it to predict the difference in returns between small and large firms in size-sorted quintile portfolios. We find that the size premium increases during periods higher stock market concentration. The effect is economically significant: during the sample period from 1926 through 2021, a one-standard deviation increase in concentration increases the expected size premium by 13.33 percentage points per annum. The average size premium is 6.33% per annum during this period, which means the size premium vanishes following a one-half standard deviation decrease in concentration. Thus, we conclude that it is important to account for stock market concentration when evaluating the size premium over different sample periods.[3] This conclusion is robust to alternative sample periods, investment horizons, and measures of stock market concentration. We also correct for the potential Stambaugh bias due to persistence in concentration, however we find the bias is small and the results remain economically significant after the correction.

While we establish our main results using portfolio-level regressions, our results also hold at the firm level, in which we include a battery of control variables to mitigate concerns of alternative explanations. One particular concern is that the effects we attribute to stock market concentration could simply be a reflection of product market concentration or the resulting market power of dominant firms. Product market concentration, which is often measured using the concentration of sales, and market power, which is often measured using markups, directly affect firm fundamentals, which in turn determine asset prices. Moreover, several studies have found that these quantities are significant predictors of stock returns (Hou and Robinson, 2006; Bustamante and Donangelo, 2017; Corhay et al., 2020; Loualiche, 2021; Clara, 2023). To isolate the effect of stock market concentration, we explicitly control for sales concentration (at both the economy and industry levels) and markups (using the measure developed by De Loecker et al. (2020)) in our regressions. Even with these controls, stock market concentration significantly predicts the size premium. In addition, if stock market concentration simply reflects product market concentration, one would expect the effects of stock market concentration to be stronger when measured within product markets (i.e., industries). In contrast, we find that stock market concentration within industries does not significantly predict the size premium. The effects of stock market concentration therefore primarily exist at the stock market level.

Given that the size premium increases during periods of higher stock market concentration, our main results indicate that the capital allocation effect dominates the relation between stock market concentration and the size premium. The results from a variety of

[3]After the seminal work by Fama and French (1992), many studies have suggested that the size premium disappeared after the early 1980s. See van Dijk (2011) for an overview of this literature.

tests on investor attention, equity financing, fundamental volatility, and capital intensity further support this conclusion. First, higher stock market concentration is associated with smaller firms receiving less investor attention, as measured by turnover, analyst coverage, and downloads for financial information. Second, smaller firms are less likely to complete a seasoned equity offering during periods of higher stock market concentration, which is consistent with it being more difficult for smaller firms to raise equity financing. Third, smaller firms have higher sales-growth volatility over the following five years when the stock market is more concentrated, which implies these firms have more volatile fundamentals during these periods. Finally, the increase of the size premium during these periods takes place predominantly among firms with a greater demand for equity financing. Specifically, the effect is concentrated among growth firms and firms in industries with a greater dependence on external equity financing. These results suggest there is less demand for the equity of smaller firms during periods of higher stock market concentration, which makes it more difficult for these firms to raise equity financing, implicitly raising their cost of equity and forcing them to adopt riskier projects to meet the increased required rate of return.

Although the capital allocation effect dominates the granular diversification effect, it does not exclude the possibility that both effects are simultaneously present. To investigate the granular diversification effect more directly, we calculate the value-weighted idiosyncratic shocks to the ten largest firms as a shock to the granularity of the stock market. Positive shocks further tilt the market portfolio toward these largest firms such that investors may require additional compensation for the increased exposure to the idiosyncratic risk of these firms. Moreover, investors could become willing to pay a premium for other firms to diversify this increased idiosyncratic risk, with the effect being amplified for smaller firms because their supply of equity deviates more significantly from a fully diversified allocation. Taken together, these effects create a discount in the value of large firms and a premium in the value of small firms, which result in lower and higher expected returns going forward, respectively. Consistent with this prediction, we find that the expected size premium decreases by 3.99

percentage points per annum following a one standard deviation increase in idiosyncratic shocks to the ten largest firms. This effect comes from both the large and small firms, whose returns increase and decrease following these shocks, respectively. Moreover, both stock market concentration and idiosyncratic shocks to the ten largest firms significantly, but oppositely, predict the size premium when included in the same regression. This result supports the conclusion that the capital allocation and granular diversification effects are simultaneously present.

This paper contributes to the literature on the asset pricing implications of a granular economy. Gabaix (2011) demonstrates that the distribution of firm sizes, as measured by sales, is "granular," i.e., it follows a power-law distribution. Under such a distribution, the central limit theorem does not hold and idiosyncratic shocks to the largest firms in the economy are not necessarily diversified in the aggregate. Herskovic et al. (2016) document a factor structure in the idiosyncratic volatility of firms and show that the common component is priced in the cross section of stock returns. Herskovic et al. (2020) present a granular network model of firm volatility and conclude that the common factor in idiosyncratic volatility is the dispersion of the firm-size distribution. Byun et al. (2023) argue that the idiosyncratic risk of large firms contaminates the measure of market returns and propose an alternative market factor that improves the performance of factor models. Gao (2023) formulates an arbitrage pricing theory that incorporates granularity and is able to explain the idiosyncratic risk premium puzzle documented by Ang et al. (2006). Abolghasemi et al. (2023) explore the effect of granularity on the Security Market Line and find that granularity can explain fluctuations in the betting-against-beta strategy proposed by Frazzini and Pedersen (2014). We study the effect of granularity on the size premium because granularity concerns the distribution of firm sizes and makes direct predictions about the diversification of idiosyncratic shocks based on firm size. We document evidence of the granular diversification effect, but find it is dominated by the capital allocation effect overall.

This paper also contributes to the literature on time-series variation in the size premium.

Since first documented by Banz (1981), several papers have raised doubts about the magnitude of the size premium in various subsamples.[4] Subsequent research has sought to explain this time-series variation. McLean and Pontiff (2016) show that anomaly returns tend to decrease after publication of the related academic paper. Hou and van Dijk (2019) find that negative profitability shocks experienced by small firms during the 1980s can explain the weak performance of the size premium during that period. Relatedly, Asness et al. (2018) find that the size premium becomes much stronger after controlling for firm quality. We show that fluctuations in the size premium can be explained by stock market concentration and its effect on capital allocation and the diversification of large-firm idiosyncratic risk.

Finally, this paper contributes to the literature on understanding the effects of increasing market concentration. Much of this research is focused on distinguishing between concerns of declining competition (Grullon et al., 2019; Covarrubias et al., 2020; De Loecker et al., 2020; Akcigit and Ates, 2023) and increasing firm productivity (Autor et al., 2020; Lashkari et al., 2023; Kwon et al., 2023; Babina et al., 2023). This conversation has taken place mostly with regard to product market concentration. The exception is Bae et al. (2021), who investigate the competition concerns resulting from stock market concentration. They find that stock market concentration reflects inefficient capital allocation, which can hinder economic growth. We study the asset pricing implications of their conclusions and find that the capital allocation effect can explain significant fluctuations in the size premium.

2 Data and Market Concentration

In this section, we describe the data used in our study and our measure of stock market concentration. We then examine how stock market concentration relates to market conditions and explore the extent to which we expect granularity concerns to be present in the U.S. stock market.

[4] See Keim (1983), Handa et al. (1989), Eleswarapu and Reinganum (1993), Dichev (1998), Hirshleifer (2001), and Amihud (2002). For a review of the size premium literature, see van Dijk (2011).

We obtain data on stock returns and stock characteristics from the Center for Research in Security Prices (CRSP). We focus our analysis on the common shares of publicly traded firms on the NYSE, AMEX, and Nasdaq from all sectors.[5] We obtain data on asset pricing factors (most importantly the portfolios sorted on size) from the Kenneth French data library. We obtain data on accounting variables, such as sales, from Compustat. The majority of our variables of interest and control variables are derived from these three sources. We also obtain data on downloads for firm filings from the EDGAR log files, data on equity issuances and mergers and acquisitions from Refinitiv Eikon, and data on analyst recommendations from IBES. A complete list of the variables used in our analysis, along with their respective data sources, is reported in Appendix A.

2.1 Market Concentration

We measure market concentration using the Herfindhal-Hirschman Index:

$$\text{HHI}_t = \sum_{i=1}^{N} \left(\frac{s_{i,t}}{\sum_{i=1}^{N} s_{i,t}} \right)^2, \tag{1}$$

where N is the number of firms in the market. We calculate three kinds of market concentration. First, we calculate stock market concentration (Cap HHI) in which $s_{i,t}$ is the market capitalization of firm i at the end of month t. Market capitalization is calculated as price multiplied by number of shares outstanding. We calculate stock market concentration using all publicly traded stocks on the NYSE, AMEX, and Nasdaq exchanges.[6] Second, we calculate sales concentration (Sale HHI) in which $s_{i,t}$ is the sales of firm i at the end of the year prior to the year of month t. Sales concentration is calculated using all firms with reported sales data in Compustat. Third, we calculate industry concentration (Industry HHI) in which $s_{i,t}$ is once again the sales of firm i as of the end of the year prior to the year

[5] Our results are robust to the exclusion of firms in the Finance and Utilities sectors.

[6] In robustness tests, we also calculate stock market concentration within each exchange and within each four-digit NAICS industry.

of month t. However, industry concentration is calculated within each four-digit NAICS industry.

[Figure 1 here]

Figure 1 plots the time series of stock market concentration from 1926 through 2021. The stock market was significantly more concentrated prior to 1970 than it has been in the past several decades. However, stock market concentration has increased substantially in recent years to levels not seen since the early 1970s.

It is important to note that stocks traded on the AMEX are covered in CRSP beginning in 1962 and stocks traded on the Nasdaq are covered in CRSP beginning in 1972. The observed decline in stock market concentration through the 1960s and 1970s therefore partially coincides with a significant increase in the number of firms covered in CRSP. However, in unreported tests, we find that the stock market concentration of only NYSE firms follows a similar trajectory. In fact, the stock market concentration of NYSE firms drives most of the variation in the stock market concentration of firms across all three exchanges. This is because HHI is primarily determined by the largest firms in the stock market, which are predominantly listed on the NYSE. Nonetheless, we find that our results are robust to considering different sample periods (e.g., 1985 through 2021) and other measures of stock market concentration, such as the share of market capitalization of the n largest firms.

[Table 1 here]

Table 1 reports regressions to illustrate the relation between stock market concentration and other macroeconomic variables. First, in Specifications (1) through (3), we show the strong connection between Cap HHI and the relative market capitalization of the top 10, 20, or 100 firms in the U.S. stock market. The results indicate that Cap HHI is strongly associated with the U.S. stock market being dominated by a few very large firms. Second, in Specification (4), we relate changes in Cap HHI to changes in the relative size dispersion of the U.S. stock market, which is captured by the difference between the 90% and 10% quantile of the size distribution scaled by the median of the size distribution. The results in Specification (4) show that changes in Cap HHI are positively associated with changes in the relative size dispersion. However, the R^2 is only 0.03, which indicates that the relative size dispersion explains only a small amount of the variation in Cap HHI. Thus, Cap HHI appears to be mostly driven by the set of very large firms.

In Specifications (5) through (9), we analyze how changes in Cap HHI are associated with stock market returns, the realized size premium, and several other macroeconomic variables. First, Specifications (5) and (6) show that changes in Cap HHI are associated with low realized stock market returns and a low realized size premium. Specifically, the regressions indicate that a one standard deviation increase in Cap HHI is associated with a monthly realized market return of -2.52% and a monthly realized size premium of -2.66%. These results indicate that stock market concentration tends to increase during periods of low realized returns, which is consistent with smaller firms being relatively more affected by poor economic conditions. In unreported tests, we show that this effect is symmetric: decreases in Cap HHI are associated with higher realized market returns and with a larger realized size premium. Second, Specifications (7) through (9) show that increases in stock market concentration are associated with increases in stock market variance, increases in the earnings yield, and increases in the default spread. These results provide additional support for the conclusion that increases in stock market concentration are associated with deteriorating market conditions. Finally, the relatively low R^2's in Specifications (4) through (9) indicate that variation in stock market concentration is not subsumed by any of the analyzed macroeconomic variables.

2.2 Stock Market Granularity

Before moving to our investigation of the effects of stock market concentration, we first need to establish that the U.S. stock market is sufficiently concentrated to generate the granularity concerns raised by Gabaix (2011). Previous work has investigated the distribution of firm sizes as reflected by the sales of public firms reported in Compustat, which follows an approximate log-normal distribution (Stanley et al., 1995). However, the exclusion of private firms biases this conclusion. Axtell (2001) examines firm sizes based on employee data from the Census and finds that firm size (S) follows a power law distribution, where

$$\mathbb{P}(S > x) = ax^{-\zeta}, \tag{2}$$

i.e., the probability that a firm is larger than x decays exponentially according to ζ, such that a smaller ζ produces a more skewed distribution. In particular, Axtell (2001) finds that the firm-size distribution matches the Zipf distribution, which is a special case of the power law distribution where $\zeta = 1$. Building on this fact, Gabaix (2011) points out that the law of large numbers does not hold when $\zeta < 2$, and thus idiosyncratic shocks play a significant role in aggregate fluctuations. We therefore expect the granular diversification effect to be present so long as the distribution of market capitalization is characterized by a power law distribution with $\zeta < 2$.

To estimate this distribution, we take the common shares of all stocks reported in CRSP. We then rank each stock by market capitalization in each month. Finally, we take the natural logarithms of each stock's market capitalization and ranking and plot the resulting distribution. If the distribution follows a power law distribution as described by Equation (2), then the plot should display an approximately linear relation. The distribution for December 2021 is presented in Panel A of Figure 2.

[Figure 2 here]

As can be seen, the distribution does not follow a linear relation in the log-log plot, and therefore is not accurately described by a power law distribution. Instead, the distribution closely resembles the distribution of sales as reported in Compustat, which has been characterized as log normal (Stanley et al., 1995) rather than power law due to the omission of private firms (Axtell, 2001). To circumvent this issue, previous research has estimated ζ using only the largest firms, thus reducing the likelihood of omitted firms (Hill, 1975; Gao, 2023). To demonstrate, we plot the top 10% of stocks for December 2021 in Panel B of Figure 2.

In this case, a linear relation is apparent. We therefore estimate ζ using this portion of the distribution by running the following cross-sectional regression:

$$\ln(Rank_i) = \alpha + \beta \ln(ME_i) + u_i, \tag{3}$$

where $Rank_i$ is stock i's market capitalization rank, ME_i is the market capitalization of stock i, $\alpha = \ln(a)$, and $\beta = -\zeta$. To illustrate the model fit, we plot the fitted OLS values (in blue) in Panel B of Figure 2. Consistent with prior research on the distribution of firm sales (Ramsden and Kiss-Haypál, 2000), we find that ζ is 1.05, which is well below the threshold of 2.0 for granular effects to be trivial. In unreported regressions, we estimate ζ at the end of each month in our sample period and find that it has fluctuated between 1.0 and 1.2 in recent decades. At no point in our sample period does ζ approach the threshold of 2.0.

However, it is important to note that the full distribution (Panel A) is in fact more concentrated than the power law distribution estimated by the largest firms (Panel B). For the distribution of firm sales, this difference can be accounted for by the omission of private firms, which are nonetheless firms competing for sales in the economy and thus need to be accounted for. For the distribution of market capitalization, however, public firms constitute the true distribution of U.S. equities available to the typical investor. The additional concentration therefore has real implications for diversification in investors' portfolios and the ζ estimated from Equation (3) likely underestimates these effects.

2.3 The Impact of Granularity on Stock Market Returns

In the previous section, we concluded that the U.S. stock market is sufficiently concentrated for granular effects to exist (i.e., idiosyncratic risk has an impact on stock market returns). We next estimate the size of this impact under the assumption of a linear factor model. In particular, we assume that the return of firm $i \in N$ at time t follows the factor model:

$$r_{i,t} = \beta_i F_t + \epsilon_{i,t}, \tag{4}$$

in which the return of stock i is driven by its exposure β_i to a systematic factor F_t and an idiosyncratic shock $\epsilon_{i,t}$.[7] Suppose $F_t \sim N(\mu_F, \sigma_F^2)$, $\epsilon_{i,t} \sim N(0, \sigma_\epsilon^2)$, and all random variables are independently distributed. Using the return equation for each firm i and its relative weight in the market $w_{i,t-1}$, the return on the stock market is computed as follows:

$$r_{M,t} = \sum_{i=1}^{N} w_{i,t-1} \cdot r_{i,t}, \text{ where } w_{i,t-1} = \frac{ME_{i,t-1}}{\sum_{i=1}^{N} ME_{i,t-1}}, \tag{5}$$

where $ME_{i,t-1}$ is the market capitalization of firm i at time $t-1$. Substituting the return for firm i from Equation (4) into the stock market return from Equation (5) yields:

$$r_{M,t} = \beta_M F_t + E_t,$$

where $\beta_M = \sum_{i=1}^{N} w_{i,t-1}\beta_i$, and $E_t = \sum_{i=1}^{N} w_{i,t-1}\epsilon_{i,t}$. It follows that the stock market is driven by a systematic component $\beta_M F_t$ and a granular residual E_t. The total stock market

[7] The stock market return is a natural choice to represent the systematic factor. However, this choice interacts with the impact of idiosyncratic risk on the market return. If the market return is not a fully diversified portfolio, then this choice contaminates the separation of a stock's return into systematic and idiosyncratic components. Byun et al. (2023) propose a market factor that is not exposed to idiosyncratic risk, thus circumventing this concern.

variance in this economy equals:

$$\text{var}(r_{M,t}) = \beta_M^2 \sigma_F^2 + HHI_{t-1}\sigma_\epsilon^2, \tag{6}$$

where HHI_{t-1} is defined in Equation (1). Equation (6) shows that stock market concentration (HHI) increases the total variance of stock market returns, and therefore plays a role in determining its risk premium.

Next, we estimate the portion of total variation in stock market returns that is attributable to the granular residual. This fraction is computed as follows:

$$\frac{\text{var}(E_t)}{\text{var}(r_{M,t})} = \frac{HHI_{t-1}\sigma_\epsilon^2}{\beta_M^2 \sigma_F^2 + HHI_{t-1}\sigma_\epsilon^2}. \tag{7}$$

Thus, the impact of the granular residual increases in stock market concentration and the variance of idiosyncratic returns, and decreases in the variance of systematic returns.

To calibrate Equation (7), we calculate the average Cap HHI in CRSP from 1926 through 2021, which is 0.99%.[8] We also compute the annualized average monthly stock market variance (i.e., the denominator in Equation (7))[9] over the same sample period, which is 3.04% per annum. We estimate idiosyncratic variance as the variance of the residuals from a regression of excess firm returns on the Fama and French (1993) three factor model from 1926 through 2021. Our sample consists of all firms that are present at the end of our sample (December 2021), and we use market capitalizations as of December 2021 to compute value-weighted idiosyncratic variance. The value-weighted (equal-weighted) average annual idiosyncratic variance is 13.7% (45.5%). Given this interval, the impact of the granular residual on stock market variance ranges from 4.5% to 14.8%,[10] and indicates that the

[8] By comparison, Cap HHI is 1.10% in December 2021.

[9] We compute the stock market variance within a month as the sum of squared daily returns in that month.

[10] To provide a comparison, we repeat this estimation for the equally weighted market portfolio, which is the portfolio that minimizes the effect of idiosyncratic risk. The average annual variance of the equally weighted market portfolio is 8.68% and the average HHI of the equally weighted market portfolio is 0.062%. These estimates produce an interval of 0.098% to 0.325% for the impact of the granular residual on the variance of the equally weighted market portfolio.

impact of the granular residual is nontrivial.[11]

The appearance of HHI in Equation (7) also motivates our choice of using HHI to measure market concentration, as the HHI of firm-level market weights (i.e., stock market concentration) directly affects the impact of idiosyncratic variance on total market variance. One could therefore interpret increases in HHI as increases in granularity. However, stock market concentration can also have other effects, such as its effect on the efficient allocation of capital. We therefore use "stock market concentration" to refer to the general concentration of market weights and "granularity" to refer to the specific impact of idiosyncratic variance on total market variance. Thus, our analysis in the following sections focuses on the effects of stock market concentration as measured by HHI, while Section 3.4 specifically focuses on the effects of granularity as measured by an estimate of the granular residual E_t.

3 Results

The core of our analysis is the relation between stock market concentration and the size premium. We investigate this relation using both portfolio-level regressions and firm-level regressions. In each regression, the independent variable of interest is Cap HHI, which reflects stock market concentration. At the portfolio level, we use the return differential between the smallest and largest size quintile to proxy for the size premium. For the regressions at the firm level, we predict monthly returns using the interaction between firm market capitalization and Cap HHI.

Section 3.1 reports the portfolio-level regressions and Section 3.2 reports the firm-level regressions. In Section 3.3, we explore the capital allocation effect as a potential explanation for the results. Finally, in Section 3.4, we document evidence in support of the granular diversification effect.

[11] This estimate is consistent with estimates from other papers (e.g., Gabaix (2011) and Byun et al. (2023)) showing that aggregate fluctuations are significantly driven by idiosyncratic shocks.

3.1 Portfolio-level Results

In this section, we investigate the relation between stock market concentration and the expected size premium at the portfolio level. In order to test this relation, we run the following regression:

$$\text{SMB}^5_{t+1,t+12} = \beta_0 + \beta_1 \text{Cap HHI}_t + \Theta' C_t + B' F_{t+1,t+12} + u_{t+1,t+12}, \tag{8}$$

where $\text{SMB}^5_{t+1,t+12}$ is the yearly return differential between the smallest and largest size quintiles (reported as a percent), C_t is a vector of control variables measured as of month t, and $F_{t+1,t+12}$ a vector of contemporaneous factor returns. If the capital allocation effect dominates the relation between stock market concentration and the size premium, then we expect β_1 to be positive. Conversely, if the granular diversification effect dominates, we expect β_1 to be negative. We standardize Cap HHI_t to have a mean of zero and standard deviation of one such that β_0 represents the average size premium over the sample period and β_1 represents the change in the size premium associated with a one standard deviation increase in Cap HHI_t. We use monthly returns to compute yearly overlapping returns and estimate the coefficients of Equation (8). In order to correct for auto-correlation in the residuals, we present Newey and West (1987) adjusted standard errors with 11 lags.

[Table 2 here]

The results from estimating Equation (8) are presented in Table 2. We find that Cap HHI positively predicts the size premium, indicating that the expected size premium increases during periods of higher stock market concentration. The effect is both statistically and economically significant. Specifically, a one standard deviation increase in stock market concentration increases the expected size premium by 9.54 percentage points per annum. We find that this effect is significant in both earlier (1926-1985) and later (1985-2021) sample periods, corresponding to increases of 9.69 and 11.26 percentage points, respectively.[12] Interestingly, while the predictive relation between stock market concentration and the size premium is significant in both sample periods, the average return on the size premium differs substantially between the two periods (10.01% in the earlier period and 0.48% in the later period). Finally, the result remains significant in the later period when replacing stock market concentration with annual innovations in concentration, which are captured by the error term from estimating an autoregressive model. Economically speaking, however, the coefficient is significant in both sample periods (4.89 and 7.61 percentage points, respectively). Overall, the results presented in Table 2 therefore suggest that the capital allocation effect dominates the relation between stock market concentration and the size premium.

A potential problem for predictive regressions involving persistent variables is that predictability is often overstated due to correlation between innovations in the returns and predictor variables.[13] Stambaugh (1999) solves for this bias in finite samples for one-period regressions and Boudoukh et al. (2022) extend the framework to multiple-period regressions with overlapping samples. We apply the multiple-period framework to our setting to calculate the Stambaugh bias due to persistence in stock market concentration.

[Figure 3 here]

In Figure 3, we show that the Stambaugh bias is small when predicting the size premium with Cap HHI. After correcting for this bias, the coefficient remains economically significant. This result holds over the full sample period, shown in Panel A of Figure 3, as well as in the earlier and later sample periods, shown in Panel B of Figure 3.[14] The unbiased coefficient,

[12] To match the sample period of the firm-level results in Section 3.2, our later sample period starts in 1985. The results are robust to splitting the sample period exactly in half.

[13] The problem arises in predictive regressions involving a persistent variable of the following form: $r_{t+1} = \beta_0 + \beta_1 X_t + u_{t+1}$ and $X_{t+1} = \omega + \rho X_t + v_{t+1}$. If $\text{cov}(u_{t+1}, v_{t+1}) < 0$, the OLS-estimate $\hat{\beta}_1$ is biased upwards and the bias increases in the persistence of X_t. See Stambaugh (1999) for more information.

[14] The coefficients are not statistically significant at the 5% level in the earlier sample period, as indicated by the shaded area in the figure. However, apart from the six- and twelve-month horizons, the unbiased coefficients are significant at the 10% level.

plotted as the red line, strongly increases up to a horizon of five years which indicates that stock market concentration is able to predict the size premium five years ahead. The bias in Equation (8) is therefore relatively small compared to the bias when predicting stock market returns using the dividend yield. This is due to the fact that the correlation between innovations in the size premium and innovations in Cap HHI is substantially smaller than the correlation between innovations in market returns and innovations in the dividend yield.

Having shown that stock market concentration predicts substantial variation in the size premium, we next include several control variables to rule out alternative channels. First, we control for the difference in firm size between the largest- and smallest-firm quintiles (i.e., the size dispersion). We do this to rule out the possibility that the documented effect is due to time-varying differences in the relative sizes of the largest and smallest firms. Second, to show that the effect of stock market concentration is distinct from that of product market concentration, we include Sale HHI in the regression. Third, in order to show that the results are not driven by correlations between Cap HHI and other macroeconomic variables that have been shown to predict future returns, we control for the market earnings yield (Earnings Yield), the difference in the dividend yield between the small and large portfolio (DP difference), the default spread (Default Spread), and the term spread (Term Spread). Finally, to show that the documented effect is not due to differences in factor exposures between small and large firms, we include contemporaneous returns on the four remaining factors proposed by Fama and French (2015), i.e., the market, the value factor, the profitability factor, and the investment factor.

[Table 3 here]

The estimates of these regressions are presented in Table 3. In each regression, Cap HHI_t, Sale HHI_t, Size Dispersion_t, Earnings Yield_t, DP Difference_t, Default Spread_t, and Term Spread_t are standardized to have a mean of zero and standard deviation of one over the sample period. Additionally, the factor returns are demeaned such that the intercept of the regression corresponds to the average annual return over the sample period. In Specifications (1)-(4) of Table 3, we show that the effect of stock market concentration on the size premium is robust to the inclusion of these control variables. A one standard deviation increase in stock market concentration increases the size premium by between 8.21 and 17.29 percentage points. The size dispersion also robustly predicts substantial variation in the size premium, particularly for the full sample period. Interestingly, product market concentration does not have an effect on the size premium that is distinguishable from zero.

In Specifications (5) and (6) of Table 3, we investigate whether the smallest or largest size quintile is the main driver of the predictability of stock market concentration for the size premium. We find that a one standard deviation increase in stock market concentration increases the expected returns of small firms by 7.44 percentage points per annum, whereas it decreases the expected return of the largest firms by 0.76 percentage points per annum. Thus, most of the effect is due to the small firms, and the finding that stock market concentration has opposite effects for small and large firms is consistent with capital being redistributed from small firms to large firms. Finally, in unreported tests, we show that stock market concentration is also able to predict the return differential on the largest and smallest size tertiles and deciles.

The results in this section provide evidence that the capital allocation effect dominates the relation between stock market concentration and the size premium. We find that the expected size premium significantly increases during periods of higher stock market concentration, which is consistent with small firms being allocated too little capital during these periods and thus increasing their expected returns. We investigate this channel more directly in Section 3.3. Regardless of the channel, however, these results highlight the importance of accounting for stock market concentration when explaining fluctuations in the size premium, which remains an open question in the literature (van Dijk, 2011; Asness et al., 2018; Hou and van Dijk, 2019; Easterwood et al., 2023).

3.2 Firm-Level Results

We next investigate the relation between stock market concentration and the size premium at the firm level. This setting allows us to include additional control variables in our regressions to exclude potential alternative explanations for our results, as well as investigate the potential channels through which stock market concentration and the size premium may be related. To do so, we run the following regression:

$$\text{Returns}_{i,t+1} = \beta_1 \text{Mkt Cap}_{i,t} + \beta_2 \text{Mkt Cap}_{i,t} \times \text{Cap HHI}_t + \Theta' C_t + \gamma_t + u_{i,t+1}, \tag{9}$$

where $\text{Returns}_{i,t+1}$ are the returns of firm i in month $t+1$ (reported as a percent), $\text{Mkt Cap}_{i,t}$ is the market capitalization of firm i in month t, and C_t is a vector of control variables measured as of month t. C_t includes the book-to-market ratio, profitability, investment, volatility, and returns of firm i in month t as well as the cumulative returns of firm i from month $t-11$ to $t-1$. Each variable and its data source is described in further detail in Appendix A and all variables are standardized to have a mean of zero and standard deviation of one.

We also include time fixed effects, γ_t, in the regression and double-cluster the standard errors at the time and firm levels. We elect for this regression model to examine stock returns so we can investigate the interaction between stock market concentration and firm size while adjusting standard errors for potential time and firm effects (Petersen, 2009).[15] By comparison, a Fama and MacBeth (1973) regression would be unable to estimate the coefficient on this interaction as stock market concentration does not vary across firms within a given cross-section. The regression focuses on predicting monthly returns, as opposed to yearly returns, to avoid potential issues regarding statistical inference when using overlapping observations of the dependent variable. Nonetheless, we present results predicting yearly returns in Internet Appendix A, and find similar results. Finally, we run this regression

[15] Note that the main effect of Cap HHI_t is absorbed by the time fixed effects.

on our later sample period (i.e., 1985 through 2017). This choice is partially due to data constraints,[16] but also to sharpen the focus of our analysis on the more modern time period.

In Equation (9), β_1 reflects the size premium and is thus expected to be negative (i.e., it reflects lower returns for firms that are one standard deviation larger). Our main parameter of interest is β_2, which reflects the change in the size premium when the stock market is one standard deviation more concentrated. Given our results from Section 3.1, we expect this coefficient to be negative.

[Table 4 here]

The results from estimating Equation (9) are presented in Table 4. Across all specifications, we find results consistent with those reported at the portfolio level. Specifically, we find that a one standard deviation increase in size implies lower returns in the next month by approximately 20 basis points when stock market concentration is at its average level. More importantly, however, this size effect becomes stronger by approximately 24 basis points when stock market concentration is one standard deviation higher than its average.[17] This result also implies that the size effect disappears when the stock market is one standard deviation less concentrated than average. We therefore conclude that stock market concentration has a large economic impact on the size premium.[18]

To control for potential alternative explanations for the relation between stock market concentration and the size premium, we sequentially introduce additional control variables in each specification. First, due to the negative correlation between stock market concentration

[16] In particular, data on markups from De Loecker et al. (2020) are only available until 2017.

[17] To compare this estimate to our portfolio-level estimate, we first annualize the effect, which implies a one standard deviation increase in stock market concentration increases the expected size premium (as measured by a one standard deviation increase in size) by 2.92 percentage points per annum. In our sample, the smallest-firm quintile is approximately 3.5 standard deviations smaller than the largest-firm quintile. Thus, the difference in returns between these quintiles following a one standard deviation increase in stock market concentration is 10.22 percentage points per annum, which is closely fits with the 8.21 percentage points per annum estimate at the portfolio level.

[18] In Internet Appendix B, we find qualitatively similar results using alternative measures of stock market concentration. Specifically, we use the combined share of market capitalization of the largest 10, 20, and 100 firms, respectively.

and market returns, it is possible that negative market returns result in both high stock market concentration and overly pessimistic valuations for small firms. Our results could therefore simply reflect a reversal of returns for small firms. Specification (1) controls for the effect of market conditions on the size premium by introducing the interaction between size and market returns as well as the interaction between size and the aggregate dividend-price ratio.

Second, to demonstrate that our results are a function of stock market concentration as opposed to product market concentration, Specification (2) includes the interaction of size and sales concentration across the entire economy. Specification (3) further controls for sales concentration within each NAICS four-digit industry, which Hou and Robinson (2006) find significantly predicts stock returns, as well as its interaction with size. Syverson (2019) argues that markups are a superior measure of market power compared to product market concentration, and several papers have found that markups are a significant predictor of stock returns (Bustamante and Donangelo, 2017; Corhay et al., 2020; Loualiche, 2021). We therefore include the measure of firm markups developed by De Loecker et al. (2020) in Specification (4).

Third, Abolghasemi et al. (2023) find that stock market concentration significantly predicts returns to the betting-against-beta anomaly (Frazzini and Pedersen, 2014). Specification (5) therefore controls for a firm's CAPM β as well as the interaction between β and stock market concentration. Fourth, given that small firms have relatively lower valuations during periods of higher stock market concentration, it could be that large firms are more likely to acquire small firms during such periods. This possibility could imply that our results are a reflection of takeover premia. Moreover, Goldie (2014) and Easterwood et al. (2023) find that merger-announcement returns explain a significant portion of the size premium. To control for this, Specification (6) includes an indicator variable equal to one if the firm was acquired in month $t + 1$ as well as the interaction between this indicator variable and size in month t.

Examining each specification, we find that none of these control variables can explain the relation between stock market concentration and the size premium.

Finally, we consider alternative market definitions for stock market concentration. Our measure of stock market concentration, Cap HHI, defines the market as all stocks traded on the NYSE, AMEX, and Nasdaq across all industries. However, boundaries to the market may exist between exchanges if transaction costs differ across exchanges or if the relation between firms and exchanges is pertinent (e.g., large firms may be able to exert market power over the exchange on which they are listed (Bae et al., 2021)). Market boundaries may also exist between industries if investors make decisions conditional on a targeted industry allocation. We therefore control for stock market concentration calculated within exchanges (NYSE, AMEX, and Nasdaq) and within industries (four-digit NAICS) in Specifications (7) and (8), respectively. We find that neither alternative market definition can explain the relation between stock market concentration and the size premium. Thus, it does not appear that this relation is a function of cross-exchange trading barriers or within-exchange market power. It also does not appear that the market for equities is significantly segmented at the industry level, which is a notable distinction between stock market concentration and product market concentration.

In summary, we find robust evidence that the size premium increases during periods of higher stock market concentration. These results support those found in the previous section and are inconsistent with a variety of potential alternative explanations. We next turn to investigating whether reduced capital allocation to small firms can can explain this relation.

3.3 Capital Allocation

Bae et al. (2021) find that concentrated stock markets are associated with less efficient capital allocation. While we largely take this conclusion as given, one possible explanation for this effect is that investors rationally allocate more of their limited attention to the largest firms in a concentrated stock market. This effect results in less demand for the equity of smaller firms, making it more difficult for smaller firms to raise equity financing and implicitly increasing their cost of equity. In response, smaller firms may need to adopt riskier projects to meet the higher required rate of return, thus increasing their expected returns.

In this section, we present evidence consistent with this channel in four parts. First, we find that smaller firms receive less investor attention during periods of higher stock market concentration. This result offers a potential explanation for why capital allocation is less efficient during these periods. Second, we find that smaller firms are less likely to complete an secondary equity offering (SEO) during periods of higher stock market concentration. This result suggests it is relatively more difficult for smaller firms to raise equity financing during these periods. Third, we find that smaller firms have higher sales-growth volatility over the following five years when the stock market is more concentrated. This result suggests that smaller firms have more volatile fundamentals during these periods. Finally, we find that our results on the relation between stock market concentration and the size premium are concentrated in firms with greater capital intensity. This result demonstrates that the observed increase in expected returns is closely linked to firms' need for equity financing.

3.3.1 Investor Attention

The first part of the capital allocation effect that we investigate is whether investors pay less attention to small firms during periods of higher stock market concentration. If investors have limited attention, it may be rational for each investor to allocate more attention to the largest firms in a concentrated stock market. While this choice may be rational for each investor, it could result in the inefficient capital allocation documented by Bae et al. (2021).

We examine three measures of investor attention. First, we calculate turnover as monthly trading volume divided by the number of shares outstanding. Second, we obtain the number of equity analysts providing next-quarter earnings forecasts for the firm from IBES. Third, we count the number of downloads for firm information each month on the SEC's EDGAR system using the EDGAR log files, which are available from 2003 through 2017.

Following Loughran and McDonald (2017), we exclude downloads from plausibly robotic IP addresses, which are identified by having downloaded more than 50 filings that day. We use each measure of investor attention as the dependent variable in Equation (9). We expect larger firms to have more investor attention generally, however our interest is whether this difference increases during periods of higher stock market concentration (i.e., the interaction coefficient, β_2, is positive).

[Table 5 here]

The results from these regressions are reported in Table 5. All specifications include time and industry fixed effects to control for level differences in investor attention across time and industries. Specifications (2), (4), and (6) also include firm fixed effects to control for stable differences in investor attention across firms. Unsurprisingly, we find that larger firms have higher turnover, more analyst coverage, and receive more downloads. More importantly, however, we find that all of these relations strengthen during periods of higher stock market concentration. These results show that investors pay relatively less attention to smaller firms during periods of higher stock market concentration.

3.3.2 Equity Financing

The second part of the capital allocation effect that we investigate is whether it is more difficult for smaller firms to raise equity financing during periods of higher stock market concentration. Given that investors pay less attention to smaller firms during these periods, the decreased demand for the equity of smaller firms could make it more difficult for these firms to raise equity financing, effectively increasing their cost of equity.[19]

To investigate this possibility, we first examine whether smaller firms are less likely to raise equity financing during periods of higher stock market concentration. To do so, we

[19] An extensive literature documents that equity valuation significantly impacts managers' decisions to raise equity financing (Graham and Harvey, 2001; Baker and Wurgler, 2002; Khan et al., 2012; Warusawitharana and Whited, 2016; Choi et al., 2023). See Baker (2009) for an overview of this literature.

obtain data from Refinitiv Eikon on all SEOs. We then create an indicator variable equal to one if the firm completes an SEO in a given month and use it as the dependent variable in Equation (9). Once again, our parameter of interest is β_2, which reflects the extent to which larger firms are more-or-less likely to complete an SEO during periods of higher stock market concentration.

[Table 6 here]

The results from this regression are presented in Specifications (1) through (3) of Table 6. Note that all variables are standardized and SEO_{t+1} is multiplied by one hundred so that the coefficients reflect percentages. Specification (1) reports the regression with time fixed effects, Specification (2) reports the regression with time fixed effects and industry fixed effects (measured at the NAICS four-digit level), and Specification (3) reports the regressions with time, industry, and firm fixed effects.

In the first two specifications, we find that smaller firms are less likely to complete an SEO when stock market concentration is at its average level. Moreover, smaller firms are even less likely to complete an SEO during periods of higher stock market concentration, corresponding to an 16% stronger effect for a one-standard deviation increase in stock market concentration (i.e., 0.019/0.118). In the third specification, we find that firms are more likely to complete an SEO when they are smaller relative to their sample average. However, this effect weakens by 20% when the stock market is one standard deviation more concentrated. These results are consistent with it being more difficult for smaller firms to raise equity financing during periods of higher stock market concentration.

3.3.3 Fundamental Volatility

The third part of the capital allocation effect that we investigate is whether smaller firms have more volatile fundamentals during periods of higher stock market concentration. This result would be consistent with smaller firms needing to adopt riskier projects during these periods because the increased difficulty in raising equity financing implies a higher cost of equity.

To investigate this possibility, we follow Herskovic et al. (2016) and measure fundamental volatility using the volatility of sales growth. Sales growth is calculated as the annual percentage change in quarterly sales from Compustat. We then calculate the volatility of sales growth over the following 20 quarters (i.e., five years) and use it as the dependent variable in Equation (9). Note that in this setting, the regression is run at a quarterly level. The parameter of interest is again β_2, which reflects the extent to which larger firms have higher sales-growth volatility during periods of higher stock market concentration.

The results from this regression are presented in Specifications (4) through (6) of Table 6. All independent variables are standardized to facilitate interpretation. Specification (4) reports the regression with time fixed effects, Specification (5) reports the regression with time fixed effects and industry fixed effects (measured at the NAICS four-digit level), and Specification (6) reports the regressions with time, industry, and firm fixed effects.

All three specifications indicate that smaller firms tend to have more volatile future sales growth at average levels of stock market concentration. This difference becomes even larger when the stock market is more concentrated. Specifically, a one standard deviation increase in stock market concentration implies a 7.6% increase in the difference in future sales-growth volatility between small and large firms (i.e., 0.017/0.225). These results are consistent with smaller firms needing to adopt riskier projects during periods of higher stock market concentration due to their higher cost of equity.

3.3.4 Expected Returns

Finally, the fourth part of the capital allocation effect that we investigate is whether the difficulty in raising equity financing can explain the documented effect on the size premium. To do so, we examine firms' demand for equity financing. If smaller firms earn higher returns because it is more difficult for them to raise equity financing, then we would expect this effect to be stronger for firms in industries that are more dependent on external equity financing. We measure an industry's dependence on external equity financing following Rajan and Zingales (1998). Specifically, we calculate the 10-year rolling sums of sales of common and preferred stock, purchases of common and preferred stock, and capital expenditures for each firm. We define the firm-level dependence on external equity financing as the difference between the rolling sums of sales and purchases of common and preferred stock divided by the rolling sum of capital expenditures. We define the industry-level dependence on external equity financing as the median firm-level dependence within each NAICS four-digit industry each year. We then separate our sample into two groups based on whether the firm is in an industry with below- or above-median industry-level dependence on external equity financing each year. Finally, we estimate Equation (9) for the two subsamples of firms.

[Table 7 here]

The results of these regressions are reported in Specifications (1) and (2) of Table 7, respectively. We find that the increased size premium during periods of higher stock market concentration takes place almost entirely in the subsample of firms in industries with above-median dependence on external equity financing.[20] This result supports the hypothesis that the size premium increases during periods of higher stock market concentration due to the increased difficulty for small firms to raise equity financing.

Finally, we investigate firms' demand for equity financing as proxied by their book-to-market ratio. Firms with lower book-to-market ratios (i.e., growth firms) are plausibly in need of more financing than firms with higher book-to-market ratios (i.e., value firms). We therefore split our sample into two groups based on the median firm book-to-market ratio each month and estimate Equation (9) for the two subsamples. Specifications (3) and (4) of Table 7 correspond to the group of firms with below-median and above-median book-to-market ratios, respectively. We find that higher stock market concentration significantly

[20] In unreported tests, we find that the difference between the interaction coefficients for the two subsamples is statistically significant at the 1% level.

increases the size premium among growth firms but not value firms, consistent with this effect being driven by demand for financing.[21]

Overall, the results in Tables 7 indicate that the size premium has a larger increase during periods of higher stock market concentration for firms with a greater demand for financing. It therefore appears that the relation between stock market concentration and the size premium is driven by small firms with a demand for financing being unable to raise the necessary capital.

In summary, the results from this section support the hypothesis that the size premium increases during periods of higher stock market concentration due to smaller firms receiving less investor attention, making it more difficult for them to raise equity financing, which induces them to take on riskier projects, thus increasing expected returns. While we find that this capital allocation effect dominates the relation between stock market concentration and the size premium, it does not exclude the possibility that the granular diversification effect is also present. We therefore investigate the granular diversification effect more directly in the next section.

3.4 Granular Diversification

In Section 2.3, we demonstrate that higher stock market concentration implies that the idiosyncratic risk of the largest firms, which is not fully diversified in a granular economy (Gabaix, 2011), has a larger impact on the total risk in the stock market. In such circumstances, investors should require a premium to hold the equity of firms whose idiosyncratic risk is not diversified, thus decreasing the size premium. However, our prior results indicate that this granular diversification effect is dominated by a capital allocation effect, such that the size premium increases during periods of higher stock market concentration.

[21] In Internet Appendix C, we investigate the ability of stock market concentration to predict the size premium within bivariate sorted portfolios on size and book-to-market ratio. This setting also allows us to test the robustness of the results presented in Table 7 to analysis in the full sample period. Consistent with those results, we find that stock market concentration significantly predicts the size premium within growth firms but not value firms.

That said, the capital allocation effect does not exclude the possibility of a granular diversification effect also being present. We therefore investigate the granular diversification effect more directly in this section.

To do so, we construct a value-weighted portfolio of the ten largest firms and compute idiosyncratic shocks to the returns of this portfolio using the three factor model by Fama and French (1993) over five-year rolling windows (i.e., idiosyncratic granularity). Idiosyncratic shocks to the returns of these firms represent unanticipated changes in the impact of idiosyncratic risk on the market portfolio (i.e., granularity). This variable closely resembles the granular residual discussed in Section 2.3, which we model as driving market returns in conjunction with a systematic factor. Furthermore, it is similar in concept to the granular residual for aggregate sales growth constructed by Gabaix (2011).

If investors require compensation for bearing the idiosyncratic risk of the largest firms, we should observe a lower expected size premium following increases in idiosyncratic granularity. We therefore use yearly idiosyncratic granularity to predict the size premium in the following year.

[Table 8 here]

The main coefficients of interest in Table 8 are presented in row Idio Granularity$_{t-11,t}$. We find that idiosyncratic shocks to the ten largest firms significantly predict the expected size premium over the full sample period, with most of the predictability coming from the later sample period (i.e., 1985 through 2021). Specification (1) reports that a one standard deviation increase in idiosyncratic granularity decreases the size premium by 2.99 percentage points per annum during the full sample period. Idiosyncratic granularity also negatively predicts the size premium during the earlier and later sample periods, as shown in Specifications (2) and (3), although the coefficient is not statistically significant in the earlier sample period. We also include the level of stock market concentration in each specification, and find that it continues to positively predict the size premium. The results therefore provide evidence in favor of both the granular diversification effect and the capital allocation effect.

In Specifications (1) through (4), we show that the effects are robust to the inclusion of known predictors of discount rates and contemporaneous returns on the factors (other than the size factor) in the five factor model by Fama and French (2015). In Specification (4), we show that including the profitability (RMW) and investment (CMA) factors decreases the coefficient for idiosyncratic granularity from 3.93 percentage points to 3.05 percentage points per annum. Finally, in Specifications (5) and (6), we show that one standard deviation increase in idiosyncratic granularity decreases expected returns for small firms by 2.71 percentage points per annum, whereas it increases expected returns for large firms by 0.34 percentage points per annum. These results show that investors demand a risk premium for holding the idiosyncratic risk of the largest stocks and are also willing to pay a premium to diversify this risk by investing more in small firms.

We run similar tests in our firm-level setting to assess the robustness of these results to the various alternative explanations discussed in Section 3.2. Specifically, we estimate Equation (9) with the addition of the interaction between size and monthly idiosyncratic granularity.

[Table 9 here]

The results from these regressions are reported in Table 9. Specification (1) focuses on the interaction between size and idiosyncratic granularity while controlling for our base set of controls as well as market conditions. We find a significant size premium at average levels of idiosyncratic granularity, with a one standard deviation increase in size corresponding to an 20 basis-point decrease in returns next month. Moreover, consistent with the results reported in Table 8, we find that this size premium is greatly mitigated by idiosyncratic shocks to granularity. A one standard deviation increase in idiosyncratic granularity decreases the size premium by 29 basis points per month.

Specification (2) of Table 9 adds the interaction between size and stock market concentration to the regression. Once again, we find that both interactions remain significant, providing evidence that the granular diversification effect and the capital allocation effect are simultaneously present. Specification (3) includes the full set of control variables in the regression and demonstrates these relations are robust to the alternative explanations discussed in Section 3.2.

Interestingly, the results in Table 9, which predict monthly returns, suggest that the size premium's association with stock market concentration is similar in magnitude to its association with idiosyncratic granularity. In contrast, the results in Table 8, which predict yearly returns, suggest that the size premium's association with stock market concentration is much stronger than its association with idiosyncratic granularity. In Internet Appendix A, we run firm-level regressions predicting yearly returns and find similar relative magnitudes to those in Table 8. To the extent that stock market concentration carries both capital allocation effects and granular diversification effects, the fact that the positive association between stock market concentration and the size premium increases over longer horizons suggests that the capital allocation effect is more persistent than the granular diversification effect. This result provides an explanation for why we observe the capital allocation effect dominating the relation between stock market concentration and the size premium.

In summary, the results in this section provide evidence that idiosyncratic shocks to granularity decrease the expected size premium. These shocks increase the presence of the largest firms' idiosyncratic risk in the market portfolio, for which investors require an additional risk premium, and in turn creates a diversification discount in the expected returns for small firms. Moreover, we find that this granular diversification effect and the capital allocation effect are simultaneously present, although our results indicate that the capital allocation effect dominates in aggregate.

4 Conclusion

In this paper, we investigate the relation between stock market concentration and the size premium. We primarily consider two channels that may affect this relation. First, stock market concentration implies that the idiosyncratic risk of large firms is not diversified in the market portfolio. This phenomenon could create a risk premium for large firms while the expected returns for small firms decrease due to increased demand for diversification. Second, stock market concentration could reflect less efficient capital allocation, which makes it more difficult for small firms to raise equity financing, thus increasing their expected returns.

Our analysis provides robust evidence that the expected size premium increases during periods of higher stock market concentration. These results indicate that the capital allocation effect dominates the relation between stock market concentration and the size premium. Consistent with this conclusion, we find that smaller firms receive less attention, are less likely to complete a seasoned equity offering, and have higher fundamental volatility during periods of higher stock market concentration. Moreover, our results occur predominantly among firms in industries with a greater dependence on external equity financing, or for firms with relatively low book-to-market ratios (i.e., growth firms). However, despite the dominance of the capital allocation effect, we also find evidence of a granular diversification effect. Specifically, we find that the expected size premium weakens following idiosyncratic shocks to the largest firms in the stock market.

These results shed light on several important phenomena. First, they uncover a novel explanation for fluctuations in the size premium, which, despite being among the most popular asset pricing phenomena, is still not fully understood. Second, they provide corroborating evidence that stock market concentration is associated with less efficient capital allocation (Bae et al., 2021). Third, they contribute to our understanding of the asset pricing implications of stock market concentration and the resulting granularity, which is increasingly important due to the steady rise in market concentration. While our analysis focuses on the implications for stock returns attributable to firm size, further research is warranted to construct a complete understanding of asset pricing in a granular economy.

References

Abolghasemi, A., H. Bhamra, C. Dorion, and A. Jeanneret (2023). Equity Prices in a Granular Economy. Working paper.

Akcigit, U. and S. T. Ates (2023). What Happened to U.S. Business Dynamism? *Journal of Political Economy 131*(8), 2059–2124.

Amihud, Y. (2002). Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets 5*(1), 31–56.

Ang, A., R. J. Hodrick, Y. Xing, and X. Zhang (2006). The Cross-Section of Volatility and Expected Returns. *Journal of Finance 61*(1), 259–299.

Asness, C., A. Frazzini, R. Israel, T. J. Moskowitz, and L. H. Pedersen (2018). Size matters, if you control your junk. *Journal of Financial Economics 129*(3), 479–509.

Autor, D., D. Dorn, L. F. Katz, C. Patterson, and J. Van Reenen (2020). The Fall of the Labor Share and the Rise of Superstar Firms. *Quarterly Journal of Economics 135*(2), 645–709.

Axtell, R. L. (2001). Zipf Distribution of U.S. Firm Sizes. *Science 293*(5536), 1818–1820.

Babina, T., A. Fedyk, A. He, and J. Hodson (2023). Artificial Intelligence, Firm Growth, and Product Innovation. *Journal of Financial Economics*. Forthcoming.

Bae, K.-H., W. Bailey, and J. Kang (2021). Why is stock market concentration bad for the economy? *Journal of Financial Economics 140*(2), 436–459.

Baker, M. (2009). Capital Market-Driven Corporate Finance. *Annual Review of Financial Economics 1*, 181–205.

Baker, M. and J. Wurgler (2002). Market Timing and Capital Structure. *Journal of Finance 57*(1), 1–32.

Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics 9*(1), 3–18.

Barkai, S. (2020). Declining Labor and Capital Share. *Journal of Finance 75*(5), 2421–2463.

Boudoukh, J., R. Israel, and M. Richardson (2022). Biases in long-horizon predictive regressions. *Journal of Financial Economics 145*(3), 937–969.

Bustamante, M. C. and A. Donangelo (2017). Product Market Competition and Industry Returns. *Review of Financial Studies 30*(12), 4216–4266.

Byun, S. J., J. Loudis, and L. Schmidt (2023). Idiosyncratic financial risk and a reevaluation of the market risk-return tradeoff. Working paper.

Choi, J., X. Tian, Y. Wu, and M. Kargar (2023). Investor Demand, Firm Investment, and Capital Misallocation. Working paper.

Clara, N. (2023). Demand Elasticities, Nominal Rigidities and Asset Prices. Working paper.

Corhay, A., H. Kung, and L. Schmid (2020). Competition, Markups, and Predictable Returns. *Review of Financial Studies 33*(12), 5906–5939.

Covarrubias, M., G. Gutiérrez, and T. Philippon (2020). From Good to Bad Concentration? U.S. Industries over the past 30 years. *NBER Macroeconomics Annual 34*(1), 1–46.

De Loecker, J., J. Eeckhout, and G. Unger (2020). The Rise of Market Power and the Macroeconomic Implications. *Quarterly Journal of Economics 135*(2), 561–644.

Decker, R. A., J. Haltiwanger, R. S. Jarmin, and J. Miranda (2016). Declining Business Dynamism: What We Know and the Way Forward. *American Economic Review 106*(5), 203–207.

Dichev, I. D. (1998). Is the Risk of Bankruptcy a Systematic Risk? *Journal of Finance 53*(3), 1131–1147.

Easterwood, S., J. Netter, B. Paye, and M. Stegemoller (2023). Taking Over the Size Effect: Asset Pricing Implications of Merger Activity. *Journal of Financial and Quantitative Analysis Forthcoming*, 1–37.

Eleswarapu, V. R. and M. R. Reinganum (1993). The seasonal behavior of the liquidity premium in asset pricing. *Journal of Financial Economics 34*(3), 373–386.

Fama, E. F. and K. R. French (1992). The cross-section of expected stock returns. *Journal of Finance 47*(2), 427–465.

Fama, E. F. and K. R. French (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics 33*(1), 3–56.

Fama, E. F. and K. R. French (2015). A five-factor asset pricing model. *Journal of Financial Economics 116*(1), 1–22.

Fama, E. F. and J. D. MacBeth (1973). Risk, return, and equilibrium: Empirical Tests. *Journal of Political Economy 81*(3), 607–636.

Frazzini, A. and L. H. Pedersen (2014). Betting against beta. *Journal of Financial Economics 111*(1), 1–25.

Gabaix, X. (2011). The Granular Origins of Aggregate Fluctuations. *Econometrica 79*(3), 733–772.

Gao, J. (2023). Granular Asset Pricing. Working paper.

Goldie, B. A. (2014). Takeovers and the Size Effect. *Quarterly Journal of Finance and Accounting 52*(3-4), 53–74.

Graham, J. R. and C. R. Harvey (2001). The theory and practice of corporate finance: Evidence from the field. *Journal of Financial Economics 60*(2-3), 187–243.

Grullon, G., Y. Larkin, and R. Michaely (2019). Are US Industries Becoming More Concentrated? *Review of Finance 23*(4), 697–743.

Handa, P., S. P. Kothari, and C. Wasley (1989). The relation between the return interval and betas: Implications for the size effect. *Journal of Financial Economics 23*(1), 79–100.

Herskovic, B., B. Kelly, H. Lustig, and S. Van Nieuwerburgh (2016). The common factor in idiosyncratic volatility: Quantitative asset pricing implications. *Journal of Financial Economics 119*(2), 249–283.

Herskovic, B., B. Kelly, H. Lustig, and S. Van Nieuwerburgh (2020). Firm Volatility in Granular Networks. *Journal of Political Economy 128*(11), 4097–4162.

Hill, B. M. (1975). A simple general approach to inference about the tail of a distribution. *The annals of statistics 3*(5), 1163–1174.

Hirshleifer, D. (2001). Investor Psychology and Asset Pricing. *Journal of Finance 56*(4), 1533–1597.

Hou, K. and D. T. Robinson (2006). Industry Concentration and Average Stock Returns. *Journal of Finance 61*(4), 1927–1956.

Hou, K. and M. A. van Dijk (2019). Resurrecting the Size Effect: Firm Size, Profitability Shocks, and Expected Stock Returns. *Review of Financial Studies 32*(7), 2850–2889.

Keim, D. B. (1983). Size-related anomalies and stock return seasonality: Further empirical evidence. *Journal of Financial Economics 12*(1), 13–32.

Khan, M., L. Kogan, and G. Serafeim (2012). Mutual Fund Trading Pressure: Firm-Level Stock Price Impact and Timing of SEOs. *Journal of Finance 67*(4), 1371–1395.

Kwon, S. Y., Y. Ma, and K. Zimmermann (2023). 100 Years of Rising Corporate Concentration. Working paper.

Lashkari, D., A. Bauer, and J. Boussard (2023). Information Technology and Returns to Scale. Working paper.

Loualiche, E. (2021). Asset Pricing with Entry and Imperfect Competition. Forthcoming at the journal of finance.

Loughran, T. and B. McDonald (2017). The Use of EDGAR Filings by Investors. *Journal of Behavioral Finance 18*(2), 231–248.

McLean, R. D. and J. Pontiff (2016). Does Academic Research Destroy Stock Return Predictability. *Journal of Finance 71*(1), 5–32.

Newey, W. K. and K. D. West (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica 55*(3), 703–708.

Petersen, M. A. (2009). Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *Review of Financial Studies 22*(1), 435–480.

Rajan, R. G. and L. Zingales (1998). Financial Dependence and Growth. *American Economic Review 88*(3), 559–586.

Ramsden, J. and G. Kiss-Haypál (2000). Company size distribution in different countries. *Physica A: Statistical Mechanics and its Applications 277*(1-2), 220–227.

Stambaugh, R. F. (1999). Predictive regressions. *Journal of Financial Economics 54*(3), 375–421.

Stanley, M. H., S. V. Buldyrev, S. Havlin, R. N. Mantegna, M. A. Salinger, and H. Stanley (1995). Zipf plots and the size distribution of firms. *Economics Letters 49*(4), 453–475.

Syverson, C. (2019). Macroeconomics and Market Power: Context, Implications, and Open Questions. *Journal of Economic Perspectives 33*(3), 23–43.

van Dijk, M. A. (2011). Is size dead? A review of the size effect in equity returns. *Journal of Banking & Finance 35*(12), 3263–3274.

Warusawitharana, M. and T. M. Whited (2016). Equity Market Misvaluation, Financing, and Investment. *Review of Financial Studies 29*(3), 603–654.

Figure 1. Stock Market Concentration

This figure plots the time series of stock market concentration (Cap HHI) for U.S. firms from 1926 to 2021. The average Cap HHI over the sample period is shown as the dashed line.

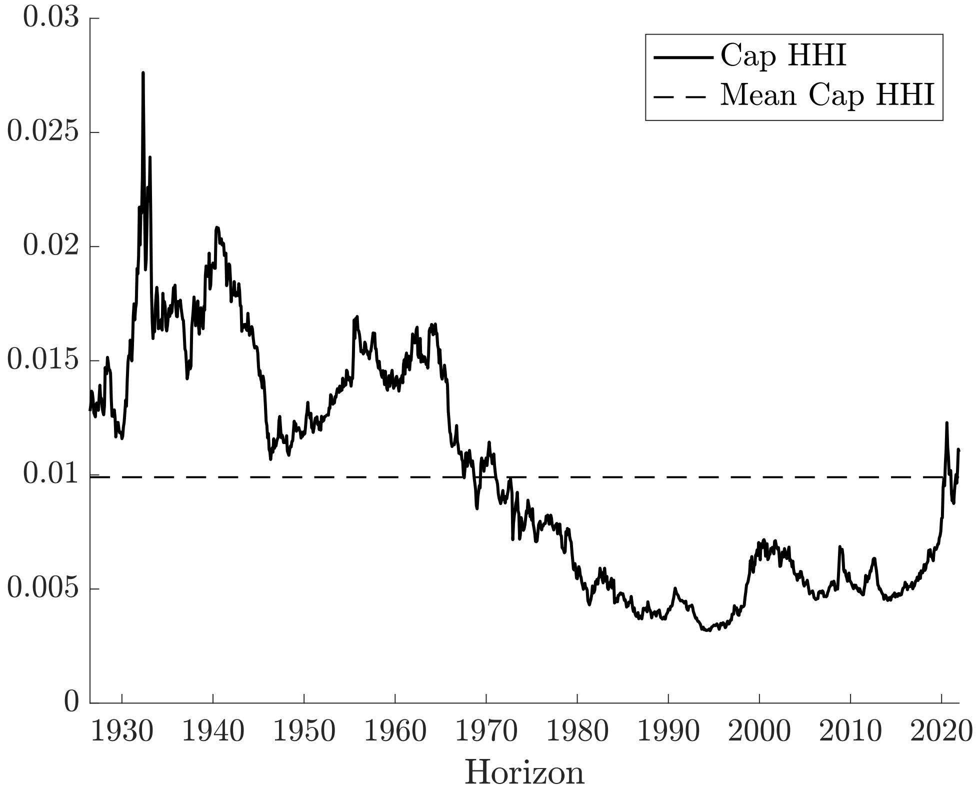
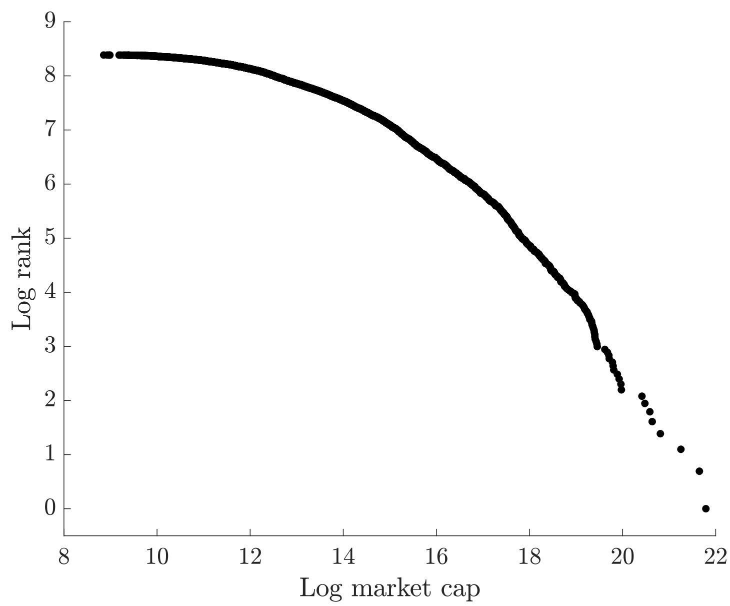


Figure 2. Distribution of Market Capitalization

This figure plots the distribution of market capitalization for U.S. firms at the end of December 2021. In Panel B, the distribution is fit to a line using the OLS regression described in Equation (3) and the fitted values are plotted in blue.

Panel A. Full Distribution



Panel B. Distribution of 10% Largest Firms

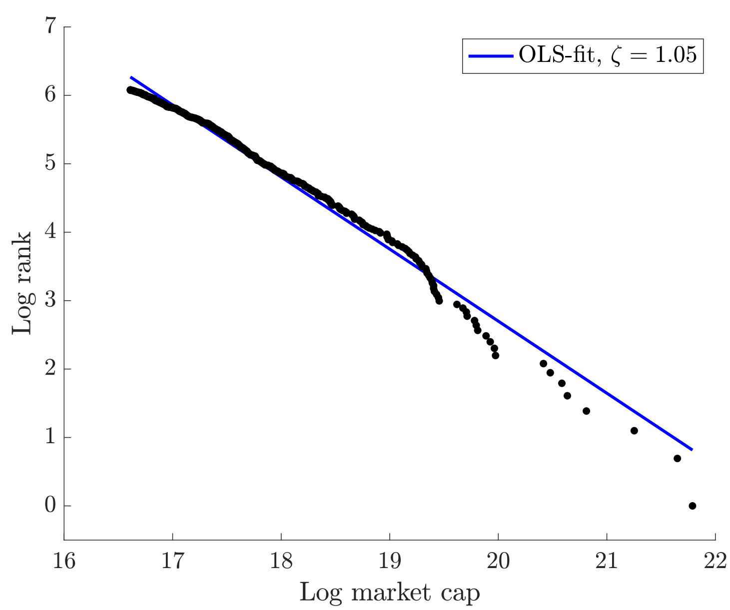
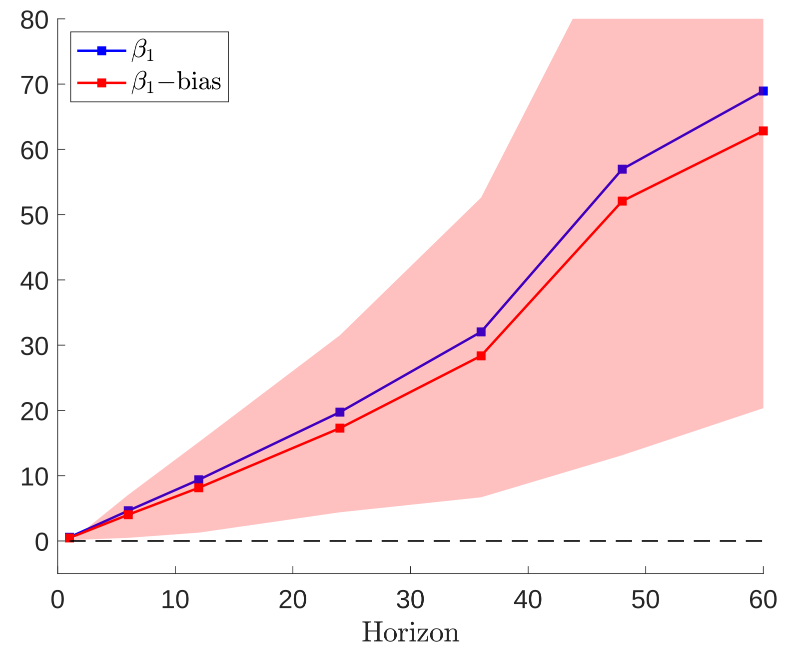


Figure 3. Stambaugh Correction

This figure plots the predictive regression coefficient (β_1) in percentage points from the regression: $\text{SMB}^5_{t+1,t+J} = \beta_0 + \beta_1 \text{Cap HHI}_t + u_{t+J}$, corrected for the Stambaugh bias following Boudoukh et al. (2022). The blue line represents the β_1 coefficient estimated using OLS, the red line represents the unbiased β_1 coefficient, and the shaded area corresponds to a 95% confidence interval of the unbiased coefficient where the standard errors are computed using Newey-West with $J - 1$ lags.

Panel A. 1926-2021



Panel B. 1926-1984 and 1985-2021

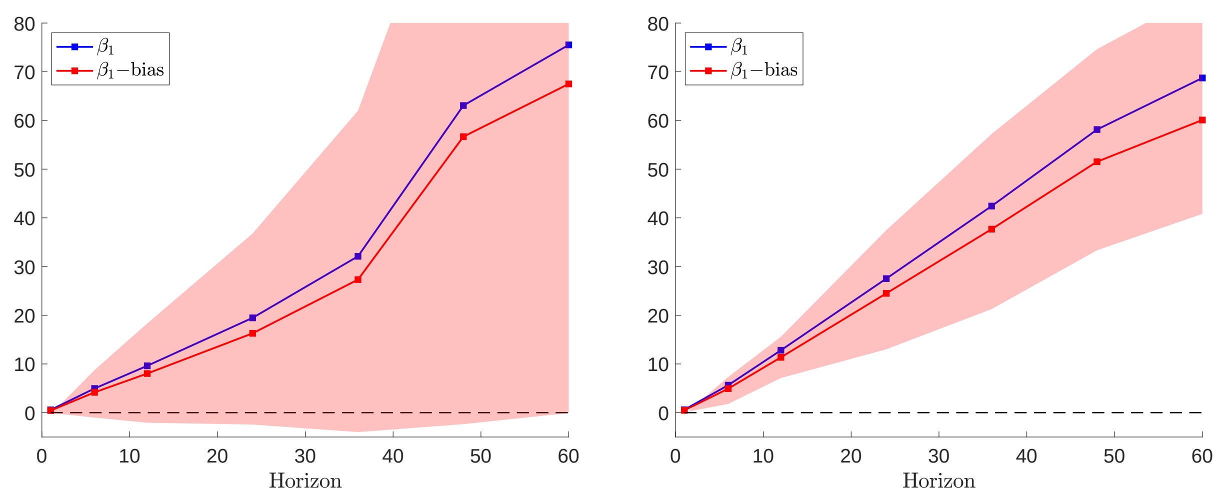


Table 1. Relation between Stock Market Concentration and Macroeconomic Variables

This table reports regressions to highlight the relation between stock market concentration (Cap HHI) and other macroeconomic variables. All regressions are run contemporaneously, and Specifications (4) through (9) include variables in first differences indicated by Δ and defined as: $\Delta X_t = X_t - X_{t-1}$. Each variable and its data source is described in Appendix A. The t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	Cap Share Top 10_t	Cap Share Top 20_t	Cap Share Top 100_t	ΔSize Dispersion$_t$	Mkt Ret$_t$	SMB_t^5	Mkt σ_t^2	Δey_t	ΔDEF_t
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	22.91***	31.69***	59.09***	0.01	0.69***	0.38**	3.06***	-0.01	-0.00
	(522.17)	(593.73)	(462.96)	(0.58)	(5.03)	(2.41)	(16.39)	(-0.49)	(-0.09)
Cap HHI$_t$	6.79***	7.83***	9.67***						
	(154.70)	(146.70)	(75.72)						
ΔCap HHI$_t$				0.10***	-2.62***	-2.66***	0.56***	0.13***	0.05***
				(6.20)	(-19.09)	(-17.04)	(3.01)	(12.81)	(11.10)
Adj. R^2	0.95	0.95	0.83	0.03	0.24	0.20	0.01	0.12	0.10
Observations	1,146	1,146	1,146	1,146	1,146	1,146	1,146	1,146	1,146
Time Period	1926–2021	1926–2021	1926–2021	1926–2021	1926–2021	1926–2021	1926–2021	1926–2021	1926–2021

Table 2. Portfolio-Level Results

This table reports regressions of returns to the small-minus-big (SMB) quintile portfolio on stock market concentration (Cap HHI). Cap HHI_t AR(1) is the error term (ϵ_t) from the following autoregressive regression: Cap $\text{HHI}_t = \rho$ Cap $\text{HHI}_{t-11} + \epsilon_t$. Each variable and its data source is described in Appendix A. Standard errors are adjusted for auto-correlation using Newey-West with 11 lags, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	$\text{SMB}^5_{t+1,t+12}$				
	(1)	(2)	(3)	(4)	(5)
Mean SMB	6.33***	10.01***	0.48	10.01***	0.49
	(2.78)	(2.94)	(0.26)	(2.81)	(0.21)
Cap HHI_t	9.54***	9.69*	11.26***		
	(2.67)	(1.87)	(5.91)		
Cap HHI_t AR(1)				4.89	7.61***
				(0.98)	(4.02)
Adj. R^2	0.10	0.07	0.35	0.02	0.16
Observations	1,135	702	433	690	433
Time Period	1926–2021	1926–1984	1985–2021	1926–1984	1985–2021

Table 3. Portfolio-Level Results and Additional Controls

This table reports regressions of returns to the small-minus-big (SMB) quintile portfolio on stock market concentration (Cap HHI) with additional control variables. Each variable and its data source is described in Appendix A. Standard errors are adjusted for auto-correlation using Newey-West with 11 lags, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	$\text{SMB}^5_{t+1,t+12}$				$\text{S}^5_{t+1,t+12} - r^f$	$\text{B}^5_{t+1,t+12} - r^f$
	(1)	(2)	(3)	(4)	(5)	(6)
Mean return	6.33***	6.33***	10.01***	0.48	10.44***	9.95***
	(3.23)	(3.93)	(4.53)	(0.34)	(8.48)	(44.93)
Cap HHI$_t$	17.29***	13.33***	11.73***	8.21***	7.44***	-0.76*
	(5.09)	(5.28)	(3.23)	(4.42)	(4.82)	(-1.81)
Sale HHI$_t$				-0.11	-0.45	-0.34
				(-0.06)	(-0.26)	(-0.98)
Size Dispersion$_t$	15.59***	11.76***	12.39***	5.20***	4.58***	-0.62**
	(4.54)	(4.39)	(3.63)	(3.83)	(4.00)	(-2.35)
Earnings Yield$_t$	4.77**	0.60	3.15	-2.55	-2.30	0.25
	(2.27)	(0.31)	(0.87)	(-1.20)	(-1.22)	(0.75)
DP Difference$_t$	7.42**	5.10**	3.72	1.83	1.59	-0.24
	(2.36)	(2.84)	(1.55)	(0.87)	(0.84)	(-0.88)
Default Spread$_t$	4.12	4.05	1.07	0.67	0.44	-0.23
	(0.97)	(1.30)	(0.23)	(0.63)	(0.47)	(-1.24)
Term Spread$_t$	3.32**	0.82	-0.33	4.08***	3.19***	-0.89***
	(2.20)	(0.53)	(-0.15)	(2.93)	(2.73)	(-3.30)
Mkt Ret$_{t+1,t+12}$		0.58***	0.67***	0.12	1.14***	1.01***
		(6.00)	(4.78)	(1.16)	(11.83)	(65.87)
HML$_{t+1,t+12}$		0.53***	0.56***	0.37***	0.30***	-0.06***
		(4.89)	(3.87)	(2.99)	(2.84)	(-2.91)
RMW$_{t+1,t+12}$				-0.62***	-0.51***	0.11***
				(-3.87)	(-3.65)	(4.30)
CMA$_{t+1,t+12}$				0.26	0.28	0.02
				(1.21)	(1.54)	(0.47)
adj. R^2	0.33	0.56	0.61	0.61	0.84	0.99
Observations	1123	1123	690	433	433	433
Time Period	1927–2021	1927–2021	1927–1984	1985–2021	1985–2021	1985–2021

Table 4. Firm-Level Results

This table reports regressions of monthly firm-level returns on the interaction between firm size (Mkt Cap) and stock market concentration (Cap HHI). The time period is 1985 through 2017. Additional controls include the natural logarithm of Book-to-Market$_t$, Profitability$_t$, Investment$_t$, the natural logarithm of Volatility$_t$, Returns$_t$, and Returns$_{t-11,t-1}$. Each variable and its data source is described in Appendix A. Standard errors are double clustered at the time and firm levels, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	Returns$_{t+1}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(Mkt Cap$_t$)	-0.192**	-0.192**	-0.197**	-0.191**	-0.228***	-0.202***	-0.245***	-0.201***
	(-2.30)	(-2.29)	(-2.35)	(-2.27)	(-3.03)	(-2.68)	(-3.05)	(-2.66)
ln(Mkt Cap$_t$) × Cap HHI$_t$	-0.229*	-0.233**	-0.234**	-0.234**	-0.246**	-0.244**	-0.235*	-0.242**
	(-1.91)	(-1.97)	(-1.98)	(-1.99)	(-2.01)	(-1.99)	(-1.84)	(-1.98)
ln(Mkt Cap$_t$) × Mkt Ret$_t$	-0.561***	-0.569***	-0.569***	-0.569***	-0.574***	-0.575***	-0.576***	-0.575***
	(-4.93)	(-5.05)	(-5.05)	(-5.05)	(-5.09)	(-5.10)	(-5.10)	(-5.10)
ln(Mkt Cap$_t$) × DP Mkt$_t$	0.003	-0.183	-0.190	-0.189	-0.183	-0.190	-0.188	-0.191
	(0.02)	(-1.24)	(-1.28)	(-1.27)	(-1.24)	(-1.29)	(-1.26)	(-1.29)
ln(Mkt Cap$_t$) × Sale HHI$_t$		0.236*	0.237*	0.238*	0.234*	0.237*	0.234*	0.236*
		(1.94)	(1.95)	(1.96)	(1.93)	(1.95)	(1.93)	(1.94)
Industry HHI$_t$			-0.061***	-0.043*	-0.044**	-0.043*	-0.046**	-0.073**
			(-2.62)	(-1.92)	(-1.97)	(-1.96)	(-2.10)	(-2.20)
ln(Mkt Cap$_t$) × Ind HHI$_t$			0.044**	0.050**	0.052**	0.048**	0.047**	0.073**
			(2.06)	(2.35)	(2.44)	(2.25)	(2.20)	(2.13)
Markups$_t$				0.120***	0.124***	0.111***	0.121***	0.111***
				(3.78)	(3.86)	(3.48)	(3.83)	(3.49)
β_t					0.112	0.112	0.114	0.110
					(1.23)	(1.23)	(1.26)	(1.21)
Beta (t) × Cap HHI$_t$					0.243	0.246	0.250	0.245
					(1.51)	(1.53)	(1.56)	(1.53)
M&A$_{t+1}$						22.696***	22.697***	22.697***
						(47.51)	(47.53)	(47.51)
ln(Mkt Cap$_t$) × M&A$_{t+1}$						-4.831***	-4.828***	-4.831***
						(-6.65)	(-6.65)	(-6.65)
Exchange Cap HHI$_t$							-0.097*	
							(-1.89)	
ln(Mkt Cap$_t$) × Exch Cap HHI$_t$							-0.057	
							(-0.99)	
Industry Cap HHI$_t$								0.038
								(0.96)
ln(Mkt Cap$_t$) × Ind Cap HHI$_t$								-0.031
								(-0.93)
Adj. R^2	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12
Observations	1,114,109	1,114,109	1,114,109	1,114,109	1,114,109	1,114,109	1,114,109	1,114,109
Additional Controls	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 5. Investor Attention

This table reports regressions of turnover (Specifications (1) and (2)), number of analyst recommendations (Specifications (3) and (4)), or downloads of firm SEC filings (Specifications (5) and (6)) on the interaction between firm size (Mkt Cap) and stock market concentration (Cap HHI). The time period for Specifications (1) through (4) is 1985 through 2017 and the time period for Specifications (5) and (6) is 2003 through 2017. Additional controls include the natural logarithm of Book-to-Market$_t$, Profitability$_t$, Investment$_t$, the natural logarithm of Volatility$_t$, Returns$_t$, and Returns$_{t-11,t-1}$. Each variable and its data source is described in Appendix A. Standard errors are double clustered at the time and firm levels, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	Turnover$_{t+1}$		ln(N Analysts$_{t+1}$+1)		ln(Downloads$_{t+1}$+1)	
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Mkt Cap$_t$)	0.431***	0.444***	0.712***	0.690***	0.735***	0.179***
	(25.85)	(15.44)	(47.53)	(36.15)	(44.66)	(9.47)
ln(Mkt Cap$_t$) × Cap HHI$_t$	0.084***	0.064***	0.022***	0.019***	0.056***	0.071***
	(5.25)	(5.58)	(3.56)	(4.19)	(5.23)	(6.21)
ln(Mkt Cap$_t$) × Mkt Ret$_t$	-0.040***	-0.034***	-0.005	-0.003	-0.003	-0.005
	(-2.94)	(-3.25)	(-1.04)	(-1.20)	(-0.81)	(-1.24)
ln(Mkt Cap$_t$) × DP Mkt$_t$	-0.099***	-0.016	-0.118***	-0.074***	-0.057***	-0.046***
	(-3.45)	(-0.60)	(-11.66)	(-9.58)	(-7.02)	(-5.87)
ln(Mkt Cap$_t$) × Sale HHI$_t$	0.160***	0.099***	0.091***	0.054***	0.008	0.003
	(7.80)	(5.21)	(10.59)	(7.81)	(0.92)	(0.36)
Industry HHI$_t$	-0.029**	-0.014	-0.037***	-0.027***	0.031***	0.010
	(-2.45)	(-1.08)	(-3.68)	(-2.76)	(2.92)	(1.05)
ln(Mkt Cap$_t$) × Ind HHI$_t$	-0.012	-0.018*	-0.022**	-0.019**	-0.014	0.015*
	(-1.47)	(-1.68)	(-2.41)	(-2.27)	(-1.58)	(1.82)
Markups$_t$	0.012	-0.017*	0.030***	0.021***	-0.016***	0.003
	(1.28)	(-1.89)	(3.75)	(3.24)	(-2.97)	(0.57)
β_t	0.244***	0.126***	0.036***	0.026***	0.065***	0.020***
	(27.21)	(13.54)	(6.00)	(5.41)	(11.94)	(4.68)
β_t × Cap HHI$_t$	0.042***	0.027***	-0.007*	-0.004	0.011**	0.013***
	(5.59)	(3.80)	(-1.75)	(-1.13)	(2.03)	(2.68)
M&A$_{t+1}$	2.144***	2.002***	0.217***	0.030***	0.799***	0.640***
	(44.21)	(44.74)	(18.77)	(3.46)	(42.65)	(39.17)
ln(Mkt Cap$_t$) × M&A$_{t+1}$	0.787***	0.709***	0.197***	0.072***	-0.073***	0.038**
	(16.01)	(16.34)	(14.55)	(7.44)	(-3.70)	(2.35)
Adj. R^2	0.37	0.57	0.53	0.82	0.81	0.89
Observations	1,112,751	1,112,671	1,114,109	1,114,035	473,720	473,693
Additional Controls	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
NAICS-4 FE	Y	Y	Y	Y	Y	Y
Firm FE		Y		Y		Y

Table 6. Equity Financing and Fundamental Volatility

This table reports monthly regressions of seasoned equity offerings (Specifications (1) through (3)) and quarterly regressions of sales-growth volatility (Specifications (4) through (6)) on the interaction between firm size (Mkt Cap) and stock market concentration (Cap HHI). SEO is an indicator variable equal to one if the firm completes a seasoned equity offerings in that month. Sales-growth volatility is calculated as the volatility of annual sales growth over the following 20 quarters (i.e., five years). The time period is 1985 through 2017. Additional controls include the natural logarithm of Book-to-Market$_t$, Profitability$_t$, Investment$_t$, the natural logarithm of Volatility$_t$, and Returns$_t$. In addition, Specifications (1) through (3) include Returns$_{t-11,t-1}$ and Specifications (4) through (6) include Returns$_{t-3,t-1}$. Each variable and its data source is described in Appendix A. Standard errors are double clustered at the time and firm levels, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	SEO$_{t+1}$			Sales-Growth Volatility$_{t+1,t+20}$		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Mkt Cap$_t$)	0.145***	0.118***	-0.158***	-0.198***	-0.225***	-0.280***
	(8.40)	(6.85)	(-3.98)	(-15.93)	(-19.73)	(-9.99)
ln(Mkt Cap$_t$) × Cap HHI$_t$	0.020*	0.019*	0.032***	-0.017*	-0.017**	-0.014**
	(1.83)	(1.76)	(2.93)	(-1.82)	(-2.15)	(-2.30)
ln(Mkt Cap$_t$) × Mkt Ret$_t$	0.018*	0.019**	0.019**	0.003	0.002	0.001
	(1.95)	(2.04)	(1.99)	(0.45)	(0.45)	(0.25)
ln(Mkt Cap$_t$) × DP Mkt$_t$	0.095***	0.093***	0.073***	-0.070***	-0.049***	-0.022**
	(4.60)	(4.51)	(3.05)	(-4.84)	(-4.17)	(-2.35)
ln(Mkt Cap$_t$) × Sale HHI$_t$	-0.089***	-0.085***	-0.050**	0.012	-0.005	-0.021**
	(-4.52)	(-4.29)	(-2.30)	(1.09)	(-0.56)	(-2.45)
Industry HHI$_t$	-0.049***	-0.030**	-0.037**	-0.035***	0.011	0.003
	(-3.75)	(-2.08)	(-2.41)	(-3.66)	(0.82)	(0.20)
ln(Mkt Cap$_t$) × Ind HHI$_t$	-0.028**	-0.028***	-0.015	-0.051***	-0.036***	0.005
	(-2.34)	(-3.02)	(-1.04)	(-6.12)	(-4.61)	(0.52)
Markups$_t$	-0.048***	-0.051***	-0.037**	-0.057***	-0.036***	-0.014*
	(-4.32)	(-3.91)	(-2.05)	(-7.21)	(-4.35)	(-1.70)
β_t	0.048***	0.086***	0.027**	0.102***	0.074***	-0.007
	(4.59)	(7.57)	(2.13)	(11.29)	(8.72)	(-0.88)
β_t × Cap HHI$_t$	0.008	0.007	-0.006	0.029***	0.011*	-0.007
	(0.86)	(0.76)	(-0.56)	(3.94)	(1.74)	(-1.37)
Adj. R^2	0.01	0.01	0.02	0.20	0.33	0.67
Observations	1,114,109	1,114,109	1,114,035	258,540	258,540	258,394
Additional Controls	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
NAICS-4 FE		Y			Y	
Firm FE			Y			Y

Table 7. Expected Returns and Capital Intensity

This table reports regressions of monthly firm-level returns on the interaction between firm size (Mkt Cap) and stock market concentration (Cap HHI). Specifications (1) and (2) correspond to firms in industries with below- and above-median external equity dependence in month t, respectively. Specifications (3) and (4) correspond to firms with below- and above-median book-to-market ratio in month t, respectively. The time period is 1985 through 2017. Additional controls include the natural logarithm of Book-to-Market$_t$, Profitability$_t$, Investment$_t$, the natural logarithm of Volatility$_t$, Returns$_t$, and Returns$_{t-11,t-1}$. Each variable and its data source is described in Appendix A. Standard errors are double clustered at the time and firm levels, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	Returns$_{t+1}$			
	External Equity Dependence		Book-to-Market	
	Low	High	Low	High
	(1)	(2)	(3)	(4)
ln(Mkt Cap$_t$)	-0.072	-0.296***	-0.122	-0.293***
	(-0.95)	(-3.44)	(-1.63)	(-3.02)
ln(Mkt Cap$_t$) × Cap HHI$_t$	-0.156	-0.297**	-0.255**	-0.125
	(-1.41)	(-2.19)	(-2.04)	(-0.83)
ln(Mkt Cap$_t$) × Mkt Ret$_t$	-0.489***	-0.635***	-0.516***	-0.501***
	(-4.55)	(-5.13)	(-4.18)	(-3.86)
ln(Mkt Cap$_t$) × DP Mkt$_t$	-0.161	-0.229	-0.077	-0.150
	(-1.01)	(-1.48)	(-0.65)	(-0.85)
ln(Mkt Cap$_t$) × Sale HHI$_t$	0.171	0.289**	0.082	0.265*
	(1.42)	(2.15)	(0.71)	(1.77)
Industry HHI$_t$	-0.053	-0.045	-0.066**	-0.069**
	(-1.64)	(-1.30)	(-2.42)	(-2.24)
ln(Mkt Cap$_t$) × Ind HHI$_t$	0.039	0.050*	0.054**	0.021
	(1.39)	(1.75)	(2.21)	(0.63)
Markups$_t$	0.163***	0.112***	0.107***	0.130***
	(3.16)	(2.92)	(3.32)	(2.77)
β_t	0.205**	0.066	0.018	0.218**
	(2.26)	(0.71)	(0.20)	(2.22)
β_t × Cap HHI$_t$	0.204*	0.247	0.157	0.340*
	(1.70)	(1.55)	(1.01)	(1.94)
M&A$_{t+1}$	21.778***	23.518***	21.150***	22.678***
	(33.43)	(38.38)	(32.40)	(37.96)
ln(Mkt Cap$_t$) × M&A$_{t+1}$	-4.545***	-5.054***	-1.609**	-7.032***
	(-5.24)	(-4.66)	(-2.26)	(-5.80)
Adj. R^2	0.13	0.12	0.13	0.12
Observations	442,792	659,346	556,960	557,149
Additional Controls	Y	Y	Y	Y
Time FE	Y	Y	Y	Y

Table 8. Portfolio-Level Idiosyncratic Shocks

This table reports regressions of returns to the small-minus-big quintile portfolio (Specifications (1) through (3)), the quintile portfolio of small firms (Specifications (5)), or the quintile portfolio of large firms (Specifications (6)) on value-weighted idiosyncratic shocks to the 10 largest firms in the past year (Idio Granularity). Each variable and its data source is described in Appendix A. Standard errors are adjusted for auto-correlation using Newey-West with 11 lags, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	$SMB^5_{t+1,t+12}$				$S^5_{t+1,t+12} - r^f$	$B^5_{t+1,t+12} - r^f$
	(1)	(2)	(3)	(4)	(5)	(6)
Mean return	6.34***	10.02***	0.48	0.48	10.44***	9.95***
	(3.99)	(4.54)	(0.36)	(0.36)	(8.97)	(45.58)
Cap HHI_t	13.76***	11.73***	7.78***	8.17***	7.12***	-1.05**
	(5.50)	(3.20)	(3.37)	(3.75)	(3.86)	(-2.27)
Idio $Granularity_{t-11,t}$	-2.99**	-2.07	-3.93***	-3.05***	-2.71***	0.34*
	(-2.33)	(-1.11)	(-3.00)	(-2.78)	(-2.78)	(1.95)
Size $Dispersion_t$	12.30***	12.28***	6.66***	6.03***	5.43***	-0.60**
	(4.71)	(3.63)	(4.84)	(4.59)	(4.96)	(-2.24)
Earnings $Yield_t$	0.23	3.12	-6.31**	-3.51	-3.43*	0.08
	(0.12)	(0.85)	(-2.44)	(-1.53)	(-1.75)	(0.20)
DP $Difference_t$	5.35***	3.78	0.64	1.89	1.57	-0.32
	(2.80)	(1.50)	(0.34)	(0.98)	(0.90)	(-1.29)
Default $Spread_t$	3.86	0.77	2.33	1.01	0.79	-0.21
	(1.26)	(0.16)	(1.96)	(0.97)	(0.88)	(-1.13)
Term $Spread_t$	0.93	0.15	5.08***	3.96***	3.10***	-0.86***
	(0.60)	(0.06)	(3.46)	(2.97)	(2.79)	(-3.17)
Mkt $Ret_{t+1,t+12}$	0.59***	0.66***	0.31***	0.15	1.16***	1.01***
	(6.08)	(4.72)	(3.52)	(1.37)	(12.16)	(65.80)
$HML_{t+1,t+12}$	0.56***	0.59***	0.28***	0.42***	0.35***	-0.07***
	(5.28)	(4.12)	(2.71)	(3.51)	(3.38)	(-2.99)
$RMW_{t+1,t+12}$				-0.57***	-0.47***	0.10***
				(-4.16)	(-3.87)	(4.47)
$CMA_{t+1,t+12}$				0.15	0.20	0.04
				(0.75)	(1.11)	(1.05)
adj. R^2	0.56	0.61	0.58	0.63	0.85	0.99
Observations	1,123	690	690	433	433	433
Time Period	1927–2021	1927–1984	1985–2021	1985–2021	1985–2021	1985–2021

Table 9. Firm-Level Idiosyncratic Shocks

This table reports regressions of firm-level monthly returns on the interaction between firm size (Mkt Cap) and the value-weighted idiosyncratic shocks to the 10 largest firms in the past month (Idio Granularity). The time period is 1985 through 2017. Additional controls include the natural logarithm of Book-to-Market$_t$, Profitability$_t$, Investment$_t$, the natural logarithm of Volatility$_t$, Returns$_t$, and Returns$_{t-11,t-1}$. Each variable and its data source is described in Appendix A. Standard errors are double clustered at the time and firm levels, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	Returns$_{t+1}$		
	(1)	(2)	(3)
ln(Mkt Cap$_t$)	-0.203**	-0.192**	-0.202***
	(-2.44)	(-2.30)	(-2.69)
ln(Mkt Cap$_t$) × Cap HHI$_t$		-0.229*	-0.243**
		(-1.96)	(-2.03)
ln(Mkt Cap$_t$) × Idio Granularity$_t$	0.290**	0.289**	0.285**
	(2.04)	(2.05)	(2.03)
ln(Mkt Cap$_t$) × Mkt Ret$_t$	-0.545***	-0.574***	-0.587***
	(-4.98)	(-5.18)	(-5.34)
ln(Mkt Cap$_t$) × DP Mkt$_t$	0.128	0.010	-0.165
	(1.15)	(0.08)	(-1.12)
ln(Mkt Cap$_t$) × Sale HHI$_t$			0.213*
			(1.76)
Industry HHI$_t$			-0.044**
			(-1.98)
ln(Mkt Cap$_t$) × Ind HHI$_t$			0.048**
			(2.28)
Markups$_t$			0.112***
			(3.49)
β_t			0.110
			(1.21)
β_t × Cap HHI$_t$			0.246
			(1.53)
M&A$_{t+1}$			22.700***
			(47.50)
ln(Mkt Cap$_t$) × M&A$_{t+1}$			-4.842***
			(-6.66)
Adj. R^2	0.11	0.11	0.12
Observations	1,114,109	1,114,109	1,114,109
Additional Controls	Y	Y	Y
Time FE	Y	Y	Y

Appendices

Appendix A

Variable definitions

- β: market beta estimated from a CAPM regression with 60-month rolling windows (CRSP).
- Book-to-Market: ratio of book equity to market capitalization.
- Book Equity: calculated as total stockholders' equity minus preferred stock plus deferred taxes and investment credit. Preferred stock is defined as, in descending order of priority, the redemption value or liquidation value or carrying value of preferred stock (Compustat).
- Cap HHI: Herfindhal-Hirschman index of market capitalization (CRSP).
- Cap Share Top 5, 10, 100: total market share of the 5, 10 or 100 largest firms divided by market capitalization of the market.
- CMA: return on the investment factor (Kenneth French library).
- Downloads: number of downloads for filings on the SEC's EDGAR system (EDGAR Log Files).
- DEF: difference in yield between a portfolio of BAA-rated minus AAA-rated corporate bonds (Federal Reserve Bank of St. Louis).
- DP Difference: Difference between the dividend-price ratio of the small quintile portfolio and the dividend-price ratio of the large quintile portfolio (Kenneth French library).
- DP Mkt: dividend-price ratio of the market (CRSP).
- Exchange Cap HHI: Herfindhal-Hirschman index of market capitalization with the NYSE, AMEX, or Nasdaq (CRSP).
- External equity dependence: following Rajan and Zingales (1998), median firm-level dependence within each NAICS four-digit industry. Firm-level dependence is the 10-year rolling sum of sales of common and preferred stock, minus the 10-year rolling sum of purchases of common and preferred stock, divided by the 10-year rolling sum of capital expenditures (Compustat).
- Ey: Earnings yield, defined as the inverted CAPE ratio (Shiller's website).
- HML: return on the value factor (Kenneth French library).

- Idio Granularity: idiosyncratic returns, estimated using a Fama and French (1993) factor model, to the value-weighted portfolio of the 10 largest firms by market capitalization (CRSP).
- Industry Cap HHI: Herfindhal-Hirschman index of market capitalization within NAICS 4-digit industries (Compustat).
- Industry HHI: Herfindhal-Hirschman index of sales within NAICS 4-digit industries (Compustat).
- Investment: annual percentage change in total assets (Compustat).
- M&A: indicator variable equal to one if the firm is acquired in that month (Refinitiv Eikon).
- Markups: estimate of firm-level markups from De Loecker et al. (2020).
- Mkt Cap: market capitalization, calculated as price times shares outstanding (CRSP).
- Mkt Ret: value-weighted market returns (CRSP).
- Mkt σ^2: stock market variance, computed as squared daily returns.
- N Analysts: number of analyst estimates for quarterly earnings (IBES).
- Profitability: profit divided by book equity. Profit is calculated as revenue minus the sum of cost of goods sold, selling, general, and administrative expense, and total interest expense (Compustat).
- Returns: stock returns (CRSP).
- r^f: One-month treasury rate (Kenneth French library).
- RMW: return on the profitability factor (Kenneth French library).
- Sale HHI: Herfindhal-Hirschman index of sales across all firms (Compustat).
- Sales-Growth Volatility: Volatility of annual growth of quarterly sales (Compustat).
- SEO: indicator variable equal to one if the firm completes a secondary equity offering in that month (Refinitiv Eikon).
- Size Dispersion: Relative size dispersion between large and small firms. 90th percentile of firm-size distribution minus 10th percentile of firm-size distribution, scaled with the median of the firm-size distribution (CRSP).
- SMB^5: Return differential between the smallest size and largest size quintile (Kenneth French library).
- SMB^2(growth, mid or value): Return differential between the small and large size portfolio within the subset of growth, mid or value firms, based on a 2 by 3 bivariate split on size and book-to-market (Kenneth French library).

- Term Spread: Difference between the 10-year interest rate and the 3-month interest rate (Federal Reserve Bank of St. Louis)
- Turnover: trading volume divided by shares outstanding (CRSP).
- Volatility: standard deviation of daily returns in a month (CRSP).

Internet Appendix A

Firm-Level Results: Yearly Returns

In this appendix, we analyze the relation between the size premium and stock market concentration as well as the size premium and idiosyncratic granularity at the firm level using yearly returns. We estimate the following equation:

$$\begin{aligned}\text{Returns}_{i,t+1,t+12} = {} & \beta_1 \text{Mkt Cap}_{i,t} + \beta_2 \text{Mkt Cap}_{i,t} \times \text{Cap HHI}_t \\ & + \beta_3 \text{Mkt Cap}_{i,t} \times \text{Idio Granularity}_{t-11,t} + \Theta C_t + \gamma_t \\ & + u_{i,t+1,t+12},\end{aligned}$$

where C_t includes the same control variables as used in Tables 4 and 9 with the exception of M&A, which is calculated from month $t+1$ to month $t+12$ to match the dependent variable.

The results are reported in Table IA1. Specification (1) focuses on the effect of stock market concentration on the size premium. We find that a one standard deviation increase in stock market concentration is associated with an increase in the expected size premium, as measured by a one standard deviation increase in size, of 3.932 percentage points per annum. Specification (2) focuses on the effect of idiosyncratic granularity on the size premium. We find that a one standard deviation increase in idiosyncratic granularity is associated with a decrease in the expected size premium of 0.958 percentage points per annum. Specification (3) demonstrates that the inclusion of both stock market concentration and idiosyncratic granularity in the regression does not change these conclusions.

Table IA1. Firm-Level Results: Yearly Returns

This table reports regressions of yearly firm-level returns on the interaction between firm size (Mkt Cap) and stock market concentration (Cap HHI) and the value-weighted idiosyncratic shocks to the 10 largest firms in the past year (Idio Granularity). The time period is 1985 through 2017. Additional controls include the natural logarithm of Book-to-Market$_t$, Profitability$_t$, Investment$_t$, the natural logarithm of Volatility$_t$, Returns$_t$, and Returns$_{t-11,t-1}$. Each variable and its data source is described in Appendix A. Standard errors are double clustered at the time and firm levels, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	Returns$_{t+1,t+12}$		
	(1)	(2)	(3)
ln(Mkt Cap$_t$)	-1.530***	-1.750***	-1.535***
	(-4.63)	(-5.02)	(-4.58)
ln(Mkt Cap$_t$) × Cap HHI$_t$	-3.932***		-3.968***
	(-5.84)		(-6.01)
ln(Mkt Cap$_t$) × Idio Granularity$_{t-11,t}$		0.958**	1.056**
		(2.03)	(2.54)
ln(Mkt Cap$_t$) × Mkt Ret$_t$	-0.651*	-0.111	-0.613
	(-1.72)	(-0.23)	(-1.62)
ln(Mkt Cap$_t$) × DP Mkt$_t$	-3.835***	-1.690**	-3.792***
	(-4.61)	(-2.15)	(-4.46)
ln(Mkt Cap$_t$) × Sale HHI$_t$	3.247***	3.133***	3.218***
	(6.12)	(4.64)	(6.03)
Industry HHI$_t$	-0.491**	-0.495**	-0.497**
	(-2.40)	(-2.43)	(-2.43)
ln(Mkt Cap$_t$) × Ind HHI$_t$	0.294	0.265	0.303
	(1.21)	(1.09)	(1.24)
Markups$_t$	1.268***	1.262***	1.272***
	(5.85)	(5.81)	(5.88)
β_t	0.966**	1.264***	0.955**
	(2.17)	(2.63)	(2.14)
β_t × Cap HHI$_t$	2.371***	2.090***	2.362***
	(3.12)	(2.83)	(3.11)
M&A$_{t+1,t+12}$	23.059***	23.123***	23.059***
	(13.31)	(13.30)	(13.31)
ln(Mkt Cap$_t$) × M&A$_{t+1,t+12}$	-13.017***	-13.586***	-12.995***
	(-7.21)	(-7.30)	(-7.20)
Adj. R^2	0.10	0.09	0.10
Observations	1,114,109	1,114,109	1,114,109
Additional Controls	Y	Y	Y
Time FE	Y	Y	Y

Internet Appendix B

Alternative Concentration Measures

In this appendix, we analyze the relation between stock market concentration and the size premium at the firm level using alternative definitions of stock market concentration. Specifically, we consider the share of market capitalization of the n largest firms in the stock market, where n is 10, 20, or 100. We then run the regression described in Equation (9), replacing Cap HHI_t with our alternative measures of stock market concentration.

The results are reported in Table IA2. We find that regardless of the measure of stock market concentration, the size premium becomes stronger during periods of higher concentration. Moreover, the coefficients reported in Table IA2 are similar in magnitude to those reported in Table 4, with a one standard deviation increase in stock market concentration corresponding to an increase in the size premium by 0.27 to 0.30 percentage points per month.

Table IA2. Alternative Concentration Measures

This table reports regressions of monthly firm-level returns on the interaction between firm size (Mkt Cap) and various measures of stock market concentration. Cap Share Top n_t is the share of market capitalization of the n largest firms in month t. The time period is 1985 through 2017. Additional controls include the natural logarithm of Book-to-Market$_t$, Profitability$_t$, Investment$_t$, the natural logarithm of Volatility$_t$, Returns$_t$, and Returns$_{t-11,t-1}$. Each variable and its data source is described in Appendix A. Standard errors are double clustered at the time and firm levels, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	Returns$_{t+1}$		
	(1)	(2)	(3)
ln(Mkt Cap$_t$)	-0.201***	-0.202***	-0.204***
	(-2.67)	(-2.66)	(-2.68)
ln(Mkt Cap$_t$) × Cap Share Top 10$_t$	-0.284**		
	(-2.29)		
ln(Mkt Cap$_t$) × Cap Share Top 20$_t$		-0.303**	
		(-2.39)	
ln(Mkt Cap$_t$) × Cap Share Top 100$_t$			-0.265**
			(-2.09)
ln(Mkt Cap$_t$) × Mkt Ret$_t$	-0.580***	-0.583***	-0.578***
	(-5.15)	(-5.17)	(-5.09)
ln(Mkt Cap$_t$) × DP Mkt$_t$	-0.201	-0.260	-0.244
	(-1.37)	(-1.61)	(-1.44)
ln(Mkt Cap$_t$) × Sale HHI$_t$	0.213*	0.258**	0.254**
	(1.77)	(2.10)	(2.05)
Industry HHI$_t$	-0.044**	-0.043*	-0.042*
	(-1.99)	(-1.93)	(-1.91)
ln(Mkt Cap$_t$) × Ind HHI$_t$	0.049**	0.047**	0.047**
	(2.30)	(2.23)	(2.20)
Markups$_t$	0.113***	0.112***	0.109***
	(3.52)	(3.50)	(3.42)
β_t	0.110	0.110	0.114
	(1.20)	(1.20)	(1.24)
β_t × Cap HHI$_t$	0.247	0.247	0.245
	(1.54)	(1.54)	(1.53)
M&A$_{t+1}$	22.693***	22.691***	22.693***
	(47.51)	(47.52)	(47.51)
ln(Mkt Cap$_t$) × M&A$_{t+1}$	-4.834***	-4.835***	-4.837***
	(-6.66)	(-6.66)	(-6.66)
Adj. R^2	0.12	0.12	0.12
Observations	1,114,109	1,114,109	1,114,109
Additional Controls	Y	Y	Y
Time FE	Y	Y	Y

Internet Appendix C

Size Premium within Growth, Mid and Value Firms

In this appendix, we use our portfolio-level analysis to investigate whether the ability of stock market concentration to predict the size premium is stronger for firms with a greater demand for financing as measured by their book-to-market ratio. A particular advantage of this setting is it allows us to investigate the hypothesis across the full sample period. We first sort stocks into portfolios based on their size and book-to-market ratios using the two-by-three bivariate portfolio sorts on size and book-to-market by Fama and French (1993). We then run regressions corresponding to Equation (8) within each portfolio. Our prediction is that higher stock market concentration has a relatively larger effect on the size premium for growth firms compared to value firms.

Table IA3 reports the results. In Specifications (1) through (3), we find that the size premium within growth firms increases by 7.55 percentage points per annum during periods of higher stock market concentration. This coefficient decreases monotonically to a statistically insignificant 1.68 percentage points per annum for value firms. These results are consistent with our hypothesis that it is more difficult for small firms to obtain equity financing during periods of increased concentration, and therefore the size premium increases the most within firms that rely on financing to a larger extent. In Specifications (4) through (6), we show that the results continue to hold in the later sample period. In each specification, we control for the average-size dispersion between big and small firms within growth, mid, and value firms to rule out the effect being driven by time-varying differences in the relative sizes of large and small firms. The remainder of the controls are included to rule out the effect being driven by other known predictors of returns or factor exposures.

Table IA3. Size Premium within Growth, Mid and Value Firms

This table reports regressions of returns to the small-minus-big (SMB) portfolio within growth, mid, and value stocks on stock market concentration (Cap HHI) with additional control variables. Size Dispersion$_t$(port) corresponds to the difference of average market capitalization of the small and big portfolio within each of the growth, mid and value splits and is scaled with the size of the median firm in the sample. Each variable and its data source is described in Appendix A. Standard errors are adjusted for auto-correlation using Newey-West with 11 lags, and the t-statistic for each estimate is reported below in parentheses. Statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *.

	$SMB^2_{t+1,t+12}$(growth)	$SMB^2_{t+1,t+12}$(mid)	$SMB^2_{t+1,t+12}$(value)	$SMB^2_{t+1,t+12}$(growth)	$SMB^2_{t+1,t+12}$(mid)	$SMB^2_{t+1,t+12}$(value)
	(1)	(2)	(3)	(4)	(5)	(6)
Mean SMB	1.73	4.00***	3.59***	-2.90	2.30***	2.46**
	(1.35)	(4.26)	(3.45)	(-2.34)	(2.98)	(2.23)
Cap HHI$_t$	7.55***	3.21**	1.68	8.85***	5.15***	4.32***
	(5.08)	(2.39)	(1.01)	(3.53)	(4.13)	(3.07)
Size Dispersion(port)$_t$	6.72***	3.21***	1.00	2.59**	4.36***	3.29**
	(4.19)	(2.66)	(0.69)	(2.30)	(5.02)	(2.50)
Earnings Yield$_t$	2.24	-0.69	-0.14	2.21	-1.26	-3.55*
	(1.41)	(-0.61)	(-0.11)	(1.01)	(-0.77)	(-1.73)
DP Difference$_t$	3.60***	2.34**	1.62	0.37	2.28**	1.86
	(2.67)	(2.09)	(1.33)	(0.25)	(1.94)	(0.97)
Default Spread$_t$	5.03**	4.20***	3.10**	-0.65	0.30	0.32
	(2.29)	(2.97)	(2.42)	(-0.63)	(0.38)	(0.35)
Term Spread$_t$	0.08	0.45	1.99*	2.10*	1.70**	6.29***
	(0.06)	(0.40)	(1.79)	(1.76)	(2.09)	(5.66)
Mkt Ret$_{t+1,t+12}$	0.34***	0.22***	0.14***	0.02	-0.02	0.20***
	(4.83)	(5.00)	(2.84)	(0.22)	(-0.26)	(2.88)
HML$_{t+1,t+12}$	-0.06	-0.00	0.05	0.14	0.19**	-0.28
	(-0.80)	(-0.09)	(0.71)	(1.18)	(2.38)	(-2.67)
RMW$_{t+1,t+12}$				-0.65***	-0.36***	0.07
				(-5.01)	(-3.74)	(0.51)
CMA$_{t+1,t+12}$				-0.01	-0.18	0.69***
				(-0.04)	(-1.46)	(3.45)
adj. R^2	0.39	0.28	0.17	0.50	0.52	0.44
Observations	1123	1123	1123	433	433	433
Time Period	1927–2021	1927–2021	1927–2021	1985–2021	1985–2021	1985–2021