

The number of listed firms, creative destruction, and idiosyncratic volatility

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Abstract

Idiosyncratic volatility (IV) increases with the number of listed firms. This finding holds for aggregate, industry, and firm IV. We explain the relation between idiosyncratic volatility and the number of listed firms through Schumpeterian creative destruction. We show that, within an industry, Schumpeterian creative destruction increases as the number of listed firms increases. Further, innovation in an industry increases with the number of listed firms. Controlling for changes in the number of listed firms, aggregate and industry IV are weakly positively related to the number of non-listed firms.

Keywords: Stock return volatility, idiosyncratic risk, creative destruction, firm age, initial public offerings, delists, public listings decline, innovation

JEL Classification: G10, G11, G12

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It is well-known that over the last fifty years the number of listed firms in the U.S. follows an inverted-U shape (Doidge, Karolyi, and Stulz, 2016; Doidge, Karolyi, Shen, and Stulz, 2025). The number of listed firms peaked in the second half of the 1990s, and the number of listed firms today is lower than fifty years ago. Stock return volatility is generally decomposed into systematic volatility and idiosyncratic volatility, where idiosyncratic volatility (IV) measures the volatility of stock returns that cannot be explained by systematic factors. Average IV exhibits temporary spikes associated with crises (Fox, Fox, and Gilson, 2016) that obscure trends. A smoothed measure of average IV follows an inverted U as well. The inverted U of average IV reaches its highest value roughly two years after the inverted U of the number of listed firms reaches its highest value. This close correspondence between the number of listed firms and smoothed average IV has not been investigated in the literature.¹

We find that the relation between changes in smoothed average IV and past changes in the number of listed firms is stronger than the relation between changes in smoothed average IV and past changes in either the number of unlisted firms potentially large enough to be listed or the number of startups with high growth potential, defined as private firms with venture capital (VC) support. The latter two relations have little explanatory power and are not consistently significant. We show that the relation between smoothed average IV and past new listings can be explained by the impact of new listings on creative destruction, so that new listings play an important role in the dynamism of listed firms. Our investigation provides new insights on Schumpeterian creative destruction, the dynamics of average IV, the determinants of firm-level IV, the role of IPOs, and the implications of changes in the number of listed and innovative non-listed firms.

We investigate whether Schumpeterian creative destruction gains strength as more firms enter public markets. New firms are expected to challenge established, older firms. The future of these innovative young firms is uncertain (Pástor and Veronesi, 2003), but they make the future of older firms uncertain as well.

¹ Campbell et al. (2023) have a figure (Figure 9) where they plot firm volatility and the number of stocks. The strong relation we focus on is obscured by the strong spikes in firm volatility arising during crises. They view the plot as supportive of a role in fundamentals for the evolution of firm volatility.

As a result, IV increases because creative destruction makes the future of firms more uncertain for both young and old firms. IV is therefore tied closely to the extent of creative destruction in the economy.²

Everything else equal, the number of listed firms increases more when the number of net new lists (i.e., new lists minus delists) is higher. Greater Schumpeterian creative destruction occurs when there is more firm creation and destruction (Aghion, Akcigit, and Howitt, 2015; Mazzucato and Tancioni, 2005). The literature on Schumpeterian creative destruction does not distinguish between listed and unlisted firms. Schumpeterian destruction occurs through competition in goods markets, so it is not even clear why the listing status of a firm should matter. The listing status of firms should matter if it helps firms compete. For instance, the listing status would be important if listed firms have better access to funding. Listing status could also be an indicator of whether a firm has progressed sufficiently to threaten existing firms. In this case, the firm would not be more likely to cause creative destruction because it is listed, but listed firms would be more likely to cause creative destruction. Using an instrumental variable, we show that exogenous variation in the number of listed firms in an industry causes an increase in the average IV of the industry. However, this approach is not sufficient to conclude that listing itself causes creative destruction. It is potentially sufficient to show that an increase in listed firms causes more creative destruction.

The link between idiosyncratic volatility and creative destruction is not new to this paper. In particular, Chun, Kim, Morck, and Yeung (2008) show that creative destruction leads to higher idiosyncratic volatility in the context of the IT revolution. Further, when Chun, Kim, and Morck (2011) measure the adoption of the new IT technology by information technology capital intensity, they find support for the view that stock return volatility rises as the new technology propagates across the economy and then ebbs when the new technology becomes widely used. The contribution of the current paper is to show that the arrival of new firms in public markets is followed by greater creative destruction and greater IV, so that creative destruction and greater IV are two sides of the same phenomenon. In this context, the findings that are new to this

² Note that a growing literature examines the implications of increases in uncertainty on firm policies. In models using a real option approach, increases in uncertainty can slow creative destruction (Campello, Kankanhalli, and Kim, 2024).

literature are: i) establishing the connection between the evolution of IV, creative destruction, and the evolution in the number of listings, ii) demonstrating that the connection between the evolution of IV and the number of listed firms exists at the aggregate level, where it explains the IV cycle of the last 50 years, at the industry level, at the firm level, and for both young and older firms, iii) showing that innovation increases with the number of listed firms, iv) showing that the link between the growth in the number of unlisted firms or the number of startups, creative destruction among public firms, and the evolution of IV for public firms is much weaker and has little explanatory power, and v) documenting that past increases in the number of public firms are important for the dynamism of public firms.

We show formally using regressions that average IV follows an inverted-U shape, and so does the number of listed firms. The inverted-U shape is steeper for equal-weighted IV than for value weighted IV, but the result holds for both IV measures. We then show that smoothed average IV is higher when there are more listed firms and that percentage changes in smoothed average IV are higher when past percentage changes in listings are higher. It follows from these results that there is a close connection between the time-series dynamics of average IV and the number of listed firms.

We then investigate directly whether the number of listed firms is a proxy for macroeconomic variables that help explain the time-series of average IV. We show that a regression of average IV on lagged market risk, credit spread, the Chicago Fed National Activity Index, the NBER indicator for recessions, and the CRSP value weighted return has an adjusted R-squared of 11% (13%) for equal-weighted (value weighted) IV. Adding to that regression the number of listed firms increases the adjusted R-squared to 67% (53%) for equal-weighted (value weighted) IV. It follows that the number of listed firms has considerable explanatory power in regressions attempting to understand the dynamics of average IV in comparison to macroeconomic variables. The relation between IV and the number of listed firms is not easily explained by the number of listed firms proxying for the state of the economy.

The number of listed firms increases more when there are more new lists than delists.³ New lists are generally young firms. We would expect average IV to be higher when there are more listed firms during our sample period because there are more listed firms following a period of more net new lists and young firms have higher IV (e.g., Pástor and Veronesi, 2003). Therefore, the relation between average smoothed IV and the number of listed firms could be due to a composition effect: there are more young firms when the number of listed firms is higher.

We find strong evidence against the hypothesis that the relation between IV and the number of listed firms is due primarily to a composition effect. To start with, we find that when we split firms into young firms (those aged five years and less) and old firms (those aged more than five years), the smoothed average IV of both young and old firms has an inverted-U shape. A composition effect cannot explain that average IV has an inverted-U shape for both young and old firms. To establish that the IV of old firms is higher when there are more listed firms, we investigate the determinants of firm-level IV during our sample period. If the relation between average IV and the number of listed firms is explained by a composition effect, the number of listed firms should not help explain firm-level IV when we account for firm characteristics as well as macroeconomic variables. We find that the number of listed firms is significantly related to firm-level IV both for young and old firms when we control for firm characteristics, including firm age and size, as well as macroeconomic variables.

Why would older firms have higher idiosyncratic volatility when there are more listed firms? Everything else equal, the number of listed firms increases as more new firms list. Small firms that innovate, which are generally young firms, do so differently from large firms. Small firms are more likely to have major inventions (Akcigit and Kerr, 2018) or radical inventions (Bena, Garlappi, and Grüning, 2016). Strikingly, the number of firms successful at radical innovation peaks in 2001 and evolves similarly to the total number of listed firms (Bena, Garlappi, and Grüning, 2016). These new firms bring with them innovations

³ There is also a growing literature that examines why the number of listed firms changes and the implications of that change. Though Doidge, Karolyi, and Stulz (2017) focus directly on the number of listed firms, there is a large number of papers that examine the IPO rate over time and why the rate has been low most years since 2000 (see, for instance, Gao, Ritter, and Zhu, 2013, and the review of the IPO literature of Lowry, Michaely, and Volkova, 2017).

that threaten older firms.⁴ These innovations may or may not scale, which explains why the new firms have high IV. Yet, whether these innovations succeed or not also affects older firms which may have their markets disrupted by successful innovations. As a result, the future of older firms is more uncertain when there are more new firms. This mechanism should be stronger at the industry level than at the aggregate level.

If there are many new firms spread across industries, the threat of creative destruction in an industry is weaker than if there is a wave of new firms within that industry. If the relation between IV and the number of listed firms is not spurious and is explained by creative destruction, we should find it at the industry level. We do. The industry IV is strongly related to the lagged increases in the number of listings. In addition, the average IV of old firms in an industry is related to the lagged increases in the number of listings as well. Further, we construct an instrument for the changes in listed firms at the industry level using the changes in listed firms in adjacent industries (see Hoberg and Philipps, 2025, for the construction of such an instrument in a different context). We find a positive relation between instrumented changes in listed firms in an industry and industry IV. This evidence shows that the relation between average IV and the number of listed firms is the outcome of an industry-level relation between IV and the rate of arrival of new firms to public markets.

With greater creative destruction, we would expect variation in firm real outcomes to increase. Specifically, we should see the dispersion of outcomes within industries to be related to the arrival of new firms to public markets. We find that this is the case. As more new firms arrive on public markets within an industry, the within-industry standard deviation of operating income increases. The standard deviation of investment increases as well. Such greater dispersion is what one would expect with greater creative destruction. We find such a dispersion increase for just old firms in an industry as well.

A traditional measure of creative destruction is turnover in the top ranked firms in an industry (Fogel, Morck, and Yeung, 2008; Bessen, Denk, Kim, and Righi, 2020; Faccio and McConnell, 2025). Using sales

⁴ Note that our focus is on firms innovating within an industry with the goal of disrupting incumbents. Innovation can lead to creative destruction more broadly as innovation in other industries can be used to disrupt an industry. We do not address this type of innovation in this paper. Kakhbod, Kogan, Li, and Papanikolaou (2024) develop a measure of exposure to creative destruction at the firm level that takes into account this type of innovation.

to rank firms, we show that there is more turnover in the top three firms in an industry or the top five firms in an industry over a three-year period or a five-year period when the number of listed firms increased more in recent years.

The Schumpeterian creative destruction is closely tied to the role of innovation. Innovation enables new firms to grow and challenge existing firms. We would therefore expect innovation to be higher if the number of listed firms grows more in an industry. We find evidence that innovation is positively related to past increases in the number of listed firms. Further, we find that IV and firm turnover are positively related to innovation.

A possible alternative explanation for the relation between the inverted-U shape of idiosyncratic volatility and the inverted-U shape of the number of listed firms follows from Fama and French (2004). They show that the number of new lists increases in the 1980s and 1990s and that the new lists are increasingly weaker firms. As the market drops in 2000s after the listing peak, many of these firms delist. To the extent that new lists are weaker and are more adversely affected by the sharp drop in the tech markets of the early 2000s, we could have inverted-U shapes for idiosyncratic volatility and the number of listed firms. To ensure that our results are not due to this phenomenon, we provide two pieces of evidence. First, we examine the relation between delists of old firms and past new listings. A positive relation between delists of old firms and past new listings would be expected with the creative destruction explanation that we advance but would not be expected if the decrease in listings is unrelated to creative destruction and caused by delists of weak firms that were recently listed. We find a strong positive relation between delists of old firms and past new listings. Second, we show that our industry findings hold if we exclude the years from 1998 to 2004 in our regressions. Our evidence supports the existence of a link between the number of listed firms and idiosyncratic volatility separate from the channel presented in Fama and French (2004).

In this study, we only have firm-level data for public firms. It could be that the relation we show between IV and the number of listed firms is due to a relation between creative destruction and the number of firms in the economy rather than between creative destruction and public firms, so that the number of listed firms proxies for the number of firms in the economy. In this case, there would be nothing special about

listings and creative destruction. An indication that it is unlikely to be so is that Davis, Haltiwanger, Jarmin, and Miranda (2006) find a decrease in IV for private firms over the period where IV increases for public firms. Census data is available for the number of firms in the aggregate as well as across industries for different firm sizes with size measured by employment. We show that the information in the number of listings is different from the information in the total number of firms in the economy. To conduct this analysis, we need a size benchmark for firms that could potentially have a material impact on creative destruction. We use a 20-employee threshold and a 100-employee threshold to examine whether there is a relation between average IV and the number of firms in the economy at the aggregate level and at the industry level. We find that the extent of creative destruction among public firms is only closely related to the number of public firms during our sample period and not to the total number of firms. A concern with using private firms that exceed an employment threshold is that these firms may be regionally specialized and not focused on innovation. We therefore conduct a similar analysis using startups with high capacity for innovation and growth, namely new firms that receive VC funding. We find similar results using that database.

Our evidence raises an important question for future work, which is why there is a strong connection between new lists and creative destruction but not between private firm creation and creative destruction. Most private firms are not focused on the type of innovation that impacts an industry, but instead engage in local or industry niche filling. For instance, a new firm could consist of half a dozen restaurants in a town. Such a firm would likely not threaten the position of established firms. With this explanation, the firms that go public are those that are most likely to cause creative destruction. A plausible explanation for this is that more disruptive firms are more likely to exit through an IPO as buying a disruptor might be internally problematic for an established firm and funders of disruptive firms want to eventually cash out. As a result, the option of exit through an IPO may be essential for disruptors, and there would be less creative disruption without that option.

The next section provides a summary of the related literature. Section 2 describes our data and how we measure IV. Section 3 shows that average IV and the number of public firms are tightly connected. Section

4 finds that the relation between average IV and the number of public firms is not explained by a composition effect due to the fact that there are more young firms when there are more public firms. Section 5 shows that aggregate and industry average IV are positively related to past aggregate, industry and instrumented industry net new lists (i.e., the percentage change in the number of listed firms). In Section 6, we demonstrate the role of creative destruction in explaining the relation between IV and the number of listed firms. Section 7 shows that the number of listed firms does not simply proxy for the number of firms in the economy and that the number of public firms explains much more the dynamics of average IV than the number of firms in the economy at the aggregate level or at the industry level. Finally, Section 8 concludes.

1. Literature on the Determinants of Idiosyncratic Equity Volatility

Campbell, Lettau, Malkiel, and Xu (2001, hereafter CLMX) document that idiosyncratic equity volatility more than doubles for the average public U.S. firm from 1962 to 1997. Researchers show that the trend in idiosyncratic risk reverses by 2003 (Brandt, Brav, Graham, and Kumar, 2010). Campbell, Lettau, Malkiel, and Xu (2023) review the evolution of idiosyncratic equity risk and of the literature two decades after their earlier paper.

Since CLMX, much research attempts to explain the high IV during the latter part of the 1990s and the prior increase in IV. The leading explanations advanced in the literature are:

- a. **Increase in competition.** This explanation advanced by Comin and Philippon (2005), Gaspar and Massa (2006), and Irvine and Pontiff (2009) predict that idiosyncratic risk increases with competition.
- b. **Schumpeterian creative destruction.** Comin and Philippon (2005) posit that an increase in R&D expenditures leads to Schumpeterian creative destruction, which creates higher idiosyncratic risk at the firm level. Comin and Mulani (2009) propose a formal model. Chun, Kim, Morck, and Yeung (2008) show that elevated heterogeneity in firm-specific stock returns is associated with industries that make more intense use of IT from 1971 to 2000. They argue that intensified creative destruction can help understand the rise in IV. Chun, Kim, and Morck (2011) hypothesize that the IT revolution

can explain both the increase and the decrease in IV as IV should fall as that revolution eventually affects most firms. They find support for this view.

- c. **Financial development.** Durnev, Li, Morck, and Yeung (2004) show that more financially developed countries have more heterogeneity in firm-specific stock returns. They advance the explanation that more private information is incorporated in stock prices when financial markets are more developed, so that average IV should increase with financial development. Brown and Kapadia (2007) attribute the increase in IV to the increased willingness of markets to welcome riskier IPOs, which they view as evidence of greater financial development.
- d. **Institutional investors.** Bennett and Sias (2006), Malkiel and Xu (2003), and Bennett, Sias, and Starks (2003) attribute the increase in idiosyncratic risk to increased institutional ownership.
- e. **Irrational exuberance.** Brandt, Brav, Graham, and Kumar (2010) attribute the high idiosyncratic risk of the late 1990s to “an episodic phenomenon, at least partially associated with retail investors” (p. 863).
- f. **Firm age.** Pástor and Veronesi (2003) build a model where investors learn about a firm’s long-run profitability over time through Bayesian updating. In such a model, young firms have greater stock return volatility. Fink, Fink, Grullon, and Weston (2010) argue that changes in the age of listed firms explain most of the increase in IV. Bekaert, Hodrick, and Zhang (2012) build on this idea by using a model where idiosyncratic volatility depends on the fraction of young firms among listed firms.
- g. **Growth opportunities.** Cao, Simin, and Zhao (2008) posit that in the presence of growth options, shareholders have incentives to take the riskiest projects. Controlling for growth options, they conclude that there is no trend in IV.
- h. **Profitability.** Wei and Zhang (2006) show that firm stock volatility is negatively related to return on equity (ROE). They find that the upward trend in average stock return volatility is fully accounted for by a downward trend in ROE and by an upward trend in the volatility of ROE.

- i. **Macroeconomic factors.** Bekaert, Hodrick, and Zhang (2012) find that most of the time variation in IV can be accounted for by variation in growth opportunities, market volatility, and the variance premium, which they argue is a business cycle sensitive risk indicator. Fox, Fox, and Gilson (2016) find that average IV increases dramatically during crisis periods.
- j. **Firm-specific human capital.** Herskovic, Kelly, Lustig, and Van Nieuwerburgh (2016) isolate a common component to time-series variation in idiosyncratic risk. The common idiosyncratic volatility (CIV) they identify represents a priced risk factor and is related to cross-sectional household income risk which suggests that a change in firm-specific risk has macroeconomic consequences.
- k. **Network effects.** Herskovic, Kelly, Lustig, and Van Nieuwerburgh (2016) show that there is a strong common factor in changes in firm-level idiosyncratic volatility. In a subsequent paper, Herskovic, Kelly, Lustig, and Van Nieuwerburgh (2020) provide evidence that the common factor in the time-series variation of firm idiosyncratic risk is the dispersion of the economy-wide firm size distribution. They develop a model where firms belong to networks of suppliers and customers. Large firms have more diversified networks. When the dispersion of the size distribution increases, shocks are less diversified. They argue that an increase in dispersion can explain the run-up in mean firm volatility in the 1990s. They also conclude that “[t]he changing composition of the universe of public firms could in principle generate the positive co-movement between firm size dispersion and firm volatility.” (p. 4122). We therefore investigate whether our results can be explained by changes in firm size dispersion. We will show that firm size dispersion is related to average IV in regressions that control for the number of listed firms, but our results are not affected.

2. Data and Construction of Volatility Measures and Explanatory Variables

Most of our analyses use a sample that includes all publicly traded U.S. firms for the period January 1978 through December 2020. We use daily data on individual stock returns and market returns from CRSP as well as annual accounting data and firm characteristics from Compustat. Appendix A defines all the variables used in our analysis. For listing variables, we limit our sample to common stocks (CRSP share

codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3). For measures of IV, we additionally exclude penny stocks with prices less than \$1.00 (in January 1997 dollars). We include all industries unless noted otherwise. A recent study (Leippold and Svaton, 2023) argues that microstructure effects explain much of the IV trend highlighted by CMLX. Campbell, Lettau, Malkiel, and Xu (2023) argue that their approach is preferable to the approach recommended by Leippold and Svaton (2023). Moreover, our results hold if we drop the stocks with capitalization below the 20th percentile of NYSE stocks and if we restrict the sample to non-financial firms. The microstructure effects emphasized by Leippold and Svaton (2023) affect mainly the smallest firms, so our conclusions do not depend on these effects.

We measure firm-level IV using a standard market-model regressions to allow for monthly firm-specific measures of risk following the literature. Specifically, using daily data, we estimate (for each firm and calendar month or year in our sample) the following model:

$$R_{i,t} = \alpha_i + \beta_i R_{M,t} + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is firm i 's stock return (in excess of the risk-free rate) on day t , and $R_{M,t}$ is the return on the CRSP value weighted market index (in excess of the risk-free rate) on day t . Our estimate of IV of firm i is the (annualized) standard deviation of the regression residual $\varepsilon_{i,t}$, and our estimate of market risk of firm i is β_i times the (annualized) standard deviation of $R_{M,t}$. We estimate the market model for all firm-months (or in some cases, firm-years) with at least 15 daily return observations available in CRSP and set a small number of observations with idiosyncratic risk less than 0.001 to missing (43 firm-month observations). Estimating this model for all stocks provides a panel of volatility estimates across firms and months (or years) as well as aggregated time-series of market and idiosyncratic risk by averaging the respective firm-level measures by month, year and/or industry, alternatively using equal- and value-weighting.⁵

⁵ We have conducted our primary analysis using other methods of IV and the conclusions of our analysis are unchanged. First, we utilize the approach of CLMX to create aggregated time-series for market risk and idiosyncratic risk for all firms. Daily data are used to construct monthly observations. Second, we use daily observations for the five factors of the Fama and French (2015) model (i.e., the excess return on the market, SMB, HML, RMW and CMA),

For macroeconomic variables other than market risk (which we measure by averaging firm-level market risk from the market model or the standard deviation of the return on the CRSP value weighted index, respectively), we use the credit spread (*Credit Spread*) defined as the difference between Moody's seasoned Baa corporate bond yield and the 10-year U.S. Treasury constant maturity rate, both provided by the Board of Governors of the Federal Reserve System. NBER business cycle dates are from the NBER website. The Chicago Fed National Activity Index (*Chicago Fed Index*) is sourced from the Federal Reserve Bank of Chicago website. The value weighted stock market return is from CRSP (*CRSP VW Index Return*).

We construct inflation-adjusted market capitalization (*Real Market Capitalization*) by multiplying market capitalization from CRSP (constructed as the product of share price and the number of shares outstanding) with the ratio of the All-items Consumer Price Index (CPI) of the month to the CPI of the base period of January 1997 (from the U.S. Bureau of Labor Statistics). We follow Herskovic, Kelly, Lustig, and Van Nieuwerburgh (2020) in computing the dispersion of real market capitalization (*Dispersion Real Market Cap*). The listing age of the firm is measured as the difference in years between the observation date and the date of the first price on CRSP (*Firm Age*). As a measure of illiquidity, we calculate the Amihud (2002) illiquidity measure (*Illiquidity Ratio*) for each firm and month in our sample by taking the average of daily absolute stock returns divided by dollar volume. Poor liquidity in some stocks could cause asynchronous price movements that would affect our regression estimates.

We use firm-level accounting variables of interest dropping observations for which Compustat data are unavailable. We calculate Tobin's q as the ratio of the market value of total assets (Total Assets – Book Value of Equity + Market Value of Equity) to the book value of Total Assets (*Tobin's Q*). We also scale Selling, General and Administrative Expenses (net of R&D Expenses) and Plant, Property & Equipment by Total Assets (*SG&A Expenses/Total Assets* and *PPE (net)/Total Assets*, respectively). Financial leverage (*Leverage*) is measured as the sum of total debt (long-term debt plus current liabilities) plus preferred stock

which are available from the Ken French data library (<http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/index.html>). Similar to the estimation of the market model, we regress the daily excess stock return of each firm on the five factors in each calendar month and obtain firm-specific measures of idiosyncratic risk as the annualized standard deviation of the regression residuals.

divided by the market value of the firm's assets (calculated as the sum of market capitalization, preferred stock and total debt). We also calculate the ratio of capital expenditures to total assets (*Capital Expenditures / Total Assets*) and the ratio of research and development (R&D) expenses to total assets (*R&D Expenses / Total Assets*), setting missing values of capital expenditures and R&D expenses to zero. We use the natural logarithm of one plus the ratio of the sum of cash and short-term investments to total assets (*Cash and Short-term Investments / Total Assets*). Return on equity (*ROE*) is calculated as the ratio of net income to shareholders' equity.

We calculate the number of publicly listed firms as the total number of CRSP common stocks listed on NYSE, AMEX or NASDAQ at the end of a calendar month or year. We define young firms as firms with *Firm Age* of less than 5 years. Our sample starts in 1978 to avoid the addition of Nasdaq firms in 1973 causing a shift in the number of firms and the number of firms classified as young. The fraction of young firms in a month is the number of firms that have been listed for less than five years divided by the total number of listed firms. We create variables capturing changes in the number of listed firms. Specifically, the percentage change in the number of listed firms defined (*Percent Change Number of Firms*). We also compute the number of new lists by the end of prior period number of listed firms (*New Lists*). Similarly, *Delists* is the ratio of the number of delisted firms and the end of prior period number of listed firms. We create these measures for the aggregate market and for each of the 48 Fama-French industries.

We focus on four proxies for the effect of creative destruction at the industry level. First, we calculate the cross-sectional standard deviation of Operating Income/Total Assets. Second, we calculate the cross-sectional standard deviation of investment (defined as the sum of R&D Expense and Capital Expenditure) scaled by Total Assets. Third, we use the ratio of delists over listings. Fourth, we use the fraction of top three (five) firms by sales at date t that are still top three (five) firms by sales at $t+3$ ($t+5$). These measures are constructed using the universe of firms on Compustat (for accounting measures) by industry (using 48 Fama French industries).

We also use innovation measures. These measures include the nominal value of patents and the number of citations of patents as in Kogan, Papanikolaou, Seru, and Stoffman (2017). We obtain these data from

Noah Stoffman's website (www.stoffprof.com). Since larger firms have more patents and citations, we scale these measures by total assets. Another measure is the ratio of R&D expenses over assets, where R&D expenses are obtained from Compustat.

3. Idiosyncratic Volatility over Time

In Figure 1, we use data from January 1963 to December 2020. In Panel A, we plot our estimates of monthly equal-weighted average idiosyncratic equity volatility (IV) and market equity volatility. We see that both market equity volatility and idiosyncratic equity volatility have sharp spikes associated with crises or periods of economic stress. Four such spikes stand out. They occur in 1987, 2000, 2008, and 2020. These episodic volatility spikes obscure trends in the volatility measures. In Panel B, we show the results for the value-weighted IV and the value-weighted market equity volatility. The pattern is similar to the pattern in Panel A. Again, there are large spikes that obscure the long-term trends.

To uncover the long-term trends, we look at smoothed IV measures. In Panel C, we plot the five-year centered moving average of the monthly equal-weighted average IV. In the following, smoothed IV denotes the five-year centered moving average of IV (black line). As is immediately obvious, the equal-weighted average smoothed IV has an inverted-U shape. It mostly increases until it reaches a peak in July-August 1999. We also plot the number of listed firms (blue line). As shown by Doidge et al. (2017), the number of listed firms has an inverted-U shape as well. The number of listed firms peaks in May-June 1997. The two inverted-U shapes are roughly similar, but the number of listed firms peaks shortly before the smoothed equal-weighted average IV. In Panel D, we show the value weighted average IV and the number of listed firms. The value weighted average IV also has an inverted-U shape that peaks slightly after the number of listed firms. In the remainder of the paper, we examine this relation between average IV and the number of listed firms. Another way to put this is that we want to understand why IV is high when the number of listed firms is high. None of the papers discussed in Section 1 shows how the evolution of IV is like the evolution in the number of listed firms and explains why this is so.

We now turn to the sample period 1978 to 2020 that we use in the remainder of the paper. The reason we drop the period from 1963 to 1977 is that we will distinguish between young and old firms. We define a young firm as one listed for less than five years. The number of firms increases at the end of 1972 because of the addition of Nasdaq-listed firms to the data. As a result, a large number of firms with *Firm Age* of zero is introduced in the data, so we would have a large fraction of young firms due to the addition of Nasdaq. By starting the sample in 1978, we can distinguish between young and old firms, where young firms are less than five years old on an exchange, without having that distinction affected by when Nasdaq was added to the CRSP data.

As is apparent from Figure 1 and as the literature shows, IV is high in crisis periods. This means that IV is related to aggregate developments in financial markets and in the economy. We now investigate whether the relation between average IV and the number of listed firms shown in Figure 1 can be explained by controlling for macroeconomic variables used to model average idiosyncratic volatility. We include among our macroeconomic variables a measure of aggregate market risk as average IV is high when aggregate market risk is high (CLMX). We also include the volatility of the CRSP value weighted market index, an indicator for NBER recessions, the credit spread, the Chicago Fed National Activity Index (the index is high when the economy is doing well), and the return on the value weighted CRSP index. We treat the dispersion of real market cap (Herskovic, Kelly, Lustig, and Van Nieuwerburgh, 2020) as a macroeconomic variable. We use monthly data.

In Panel A of Table 1, we first report the results for our market model measure of equal-weighted average IV and our measure of value-weighted average IV when all variables are observed contemporaneously. The regression in the first column omits the number of firms. We find that the equal-weighted average IV increases with market risk and NBER recessions; it falls with the credit spread and the dispersion of real market cap. The adjusted R-squared is 23% (it is 14% without the dispersion of real market cap). In Column (2), we show estimates of the regression of Column (1) when we add the number of listed firms (in thousands). The number of listed firms has a significant positive coefficient. The adjusted R-squared

increases from 23% in the first column to 75% (it is also 75% if we omit the market cap dispersion), indicating that the explanatory power of the number of listed firms is very large. The dispersion of real market cap, market risk, the credit spread, and the indicator for NBER recessions all have significant positive coefficients, while the coefficient on the Chicago Fed index is negative and significant. In the third and fourth columns, we re-estimate the regressions in the first two columns but using the value weighted average IV. The results are similar except that the dispersion of real market cap does not have a significant coefficient in the regression that includes the number of firms. The adjusted R-squared without the number of listed firms is higher at 24%, and the adjusted R-squared with the number of listed firms is lower at 61%. There is still an extremely large increase in the adjusted R-squared. A concern is that the macroeconomic variables might be affected by the level of IV. One way to address this concern is to lag the macroeconomic variables. We do so in the last 4 columns. We again find a strong relation between the level of average IV and the number of firms controlling for macroeconomic variables.

To examine the statistical significance of the connection between the two inverted-U shape patterns shown in Figure 1, we use annual data and regress smoothed average IV on the number of listed firms lagged three years (so that the measurement of the number of firms is not made inside the moving average window). This regression approximates the relation shown in Panel C of Figure 1 and we report the results in Panel B of Table 1. We first show estimates using the smoothed, equal-weighted IV average. The standard errors are New-West with five lags. We start with a regression in levels. We find a strong relation between smoothed IV and the lagged number of listed firms. The coefficient on the lagged number of listed firms is highly significant and the adjusted R-squared is 75%. Next, we re-estimate the regression but use percentage changes of smoothed equally-weighted average IV and percentage changes of the number of firms. The regression coefficient is positive and significant as expected. Not surprisingly, the adjusted R-squared is lower as it drops to 21%. We then turn to estimating the same regressions for smoothed, value-weighted average IV. We find similarly strong results for the level of average IV, but the positive coefficient is only significant at the 10% level for percentage changes of value weighted average IV.

Our evidence in this section shows a strong relation between average IV and the number of listed firms. This relation is not explained by the changes in the dispersion of real market cap. As shown in Internet Appendix Figure 1, while real market cap dispersion increases with average IV during the runup of average IV, it does not fall after the peak of average IV and hence does not capture the decrease in average IV.

4. Is It a Composition Effect Due to New Lists?

The number of listed firms at time t is the number of listed firms at an earlier time plus the sum of the net new lists from that earlier time to time t . For the number of listed firms to be high at t compared to time $t-j$, the sum of the net new lists between $t-j$ and t has to be high. In contrast, if the number of listed firms at t is lower than at $t-j$, the sum of the net new lists must be negative. For net new lists to be positive, new firms have to be listed in excess of listed firms dropping out of the exchanges. It follows that, everything else equal, the number of firms is high when there are more recently listed firms. As already discussed, young firms have higher idiosyncratic volatility. Recently listed firms have high IV because young firms have high IV. Hence, the result we find could simply be a composition effect. We show in this section that this is not the case.

We first show that the change in the smoothed average IV from $t-1$ to t is related to past percentage changes in the number of listings. In Table 2, we show estimates of a regression of percentage changes in smoothed average IV on percentage changes in the number of listed firms using five lags. We control for the macroeconomic variables we use in Panel A of Table 1.⁶ We report two sets of results for each regression. The first set of results uses five lags of percentage changes in the number of listed firms. With these results, the first two lags overlap with the equal-weighted average IV used to construct the five-year centered moving average. The second set of results eliminates this overlap and only uses the last three lags. With both sets of results, we find that the sum of the coefficients is significantly positive. We then do the

⁶ We do not include the dispersion of real market cap as we used that variable to consider an alternative explanation.

same for the value-weighted average IV. In that case, we find the sum of the coefficients to be significantly positive when we use five lags but not when we use three lags.

We have now shown that percentage changes in smoothed IV are related to percent changes in the number of listed firms. The number of listed firms increases with the number of new lists and falls with the number of delists. New lists are younger firms than the typical listed firm. As a result, there should be a relation between the number of listed firms and the average age of firms. Using listing age, we divide firms between young and old firms based on *Firm Age* so that young firms are listed for five years or less and old firms are listed for more than five years. In Panel A of Figure 2, we show that the number of young firms increases sharply over our sample period before peaking in December 1996. In contrast, the evolution of the number of old firms is much more subdued. In Panel B, we show that the ratio of the equal-weighted average IV of young firms over the equal-weighted average IV of old firms does not change much over time as it is typically greater than 1.2 and less than 1.4. In comparison, the ratio of the number of young firms to the number of old firms exhibits much variation. It peaks in October 1987 at 0.936, so that there are almost as many young firms as old firms at that time. The ratio then falls before reaching another peak in December 1996 at 0.880. The ratio has its lowest value in March 1978 at 0.144. Its lowest value after the peak in December 1996 is 0.182 in early 2013. It follows from this that the evolution of the fraction of young firms does not match the evolution of the smoothed equal-weighted average IV as smoothed average IV does not peak in 1987. Internet Appendix Figure 2 shows in Panels A and B that our conclusions are similar if we use ten years as the threshold for old firms. Note that when we use the ten-year threshold, our sample starts in 1983 so that we do not have a discontinuity in the number of old firms because of the addition of the Nasdaq data.

The fact that the ratio of the average IV of young firms to the average IV of old firms does not exhibit the same pattern as the ratio of young firms to old firms suggests that the volatility of young firms moves like the volatility of old firms. We verify this in Panel C of Figure 2. In that panel, we see that the smoothed equal-weighted average IV of young firms as well as the smoothed equal-weighted average IV of old firms exhibit the same inverted-U shape. Consequently, the inverted-U shape cannot be due to a composition

effect caused by the shifting age composition of listed firms. The results for value weighted IV are shown in Panel D. We see there that the smoothed, average value-weighted IV for old firms exhibits much less variation than the smoothed, average value-weighted IV for young firms. These results hold as well when we define old firms as those that are more than ten years old as shown in Panel C of Internet Appendix Figure 2.

Figure 2 suggests that the number of listed firms should be helpful in explaining the IV of both young and old firms. However, Kahle and Stulz (2017) show that firm characteristics are quite different in the 2000s than they are at the beginning of our sample. As discussed in Section 2, it is well-known that firm characteristics are related to IV. Illiquid firms and small firms tend to have higher IV. So do highly levered firms. Firms with higher R&D have higher IV (Comin and Philippon, 2005, and Bartram, Brown, and Stulz, 2012). So do firms with higher cash holdings. Hence, it could be that the number of firms proxies for other firm characteristics than firm age, so that when we control for firm characteristics the number of firms may no longer be significant. We estimate regressions of firm IV on macroeconomic variables, firm characteristics, and the number of listed firms. If the number of listed firms proxies for firm characteristics, we would not expect the number of listed firms to be related to firm IV. Our regressions include all firms but those in the Fama-French 48 classification for utilities and financial firms because they include regulated firms. Our regressions include industry fixed effects.

Table 3 shows the results. We report results separately for young firms and old firms to show that the IV of both types of firms is related to the number of firms. We use annual data and lag the regressors by a year. The standard errors are clustered by year and firm. Column (1) presents the results for young firms when we do not include the number of firms and Column (2) adds the number of firms to the regression. No macroeconomic variable is significant when we control for firm characteristics. The coefficients on the firm characteristics are those generally found in the literature. IV increases with Tobin's Q, leverage, R&D, capital expenditures, and cash holdings. It falls with market capitalization, plant, property, and equipment, and ROE. The coefficient on the number of firms in Column (2) is positive and significant at the 1% level. Therefore, we find that firm IV increases with the number of firms when we control for a broad range of

firm characteristics. The coefficient on illiquidity is significant and negative in Column (2), but insignificant and negative in Column (1). All other coefficients in Column (2) are of the same sign and significant as in Column (1). The adjusted R-squared increases from 33% to 38% when we add the number of firms.

In Table 3 Panel B, we estimate the same regressions for old firms. The coefficients on macroeconomic variables and on firm characteristics have mostly, but not always, the same sign and significance for old firms as for young firms. The coefficients on the number of firms are always positive and significant, but they are smaller than in the regressions for young firms. Results for some macro variables differ from Panel A. In particular, the Chicago Fed index has a negative significant coefficient for old firms. Further, cash holdings have positive and significant coefficients for young firms, but insignificant coefficients for old firms. The increase in the adjusted R-squared is also smaller than for the regressions with young firms since the adjusted R-squared is 49% without including the number of firms and 51% with the number of firms. Results for the same regressions but with all firms are reported in Table 3 Panel C and, as expected, show that the number of firms is significantly related to IV. Internet Appendix Table 1 shows that the results of Panel B hold when the threshold for old firms is ten years instead of five years.

It follows from this section that the relation between IV and the number of firms cannot be explained by a composition effect. Importantly, the IV of both old firms and new firms is higher when the number of firms is higher – even after controlling for firm age. Any explanation for this relation must therefore show why the IV of both new and old firms is higher when there are more listed firms.

5. New Lists and Firm Volatility at the Industry Level

We have now shown that the relation between the number of firms and average IV is not due to a composition effect and it holds in changes, so that it is unlikely to be explained by common trends. In this section, we start investigating our explanation for the relation. This explanation is that creative destruction is greater when there are more new firms. Such an explanation has a strong foundation in the literature: new firms challenge existing ones with new technologies or business models. Hence, as there are more new firms, we expect more firms to be challenged. New firms may or may not succeed in their challenge, which

makes their stock price more volatile. Older firms may repel the challenge or succumb to it. This means that the existence of challengers makes older firms more volatile. If our explanation is correct, it should apply at the industry level.

With the creative destruction hypothesis, we expect smoothed average IV to be related to the number of firms and hence to past increases in the number of firms at the industry level. The dynamics of the number of listed firms differ across industries, so that a common explanation having to do with aggregate trends is unlikely to explain these dynamics. We use the Fama-French 48 industries as our industries but omit industries that include regulated firms (utilities, banking, insurance, real estate, etc.).

We investigate whether our earlier results hold at the industry level. Using yearly data, we estimate a regression of the percentage change in the industry-level smoothed average IV from $t-1$ to t on lagged percentage changes in the number of listed firms in the industry, using five lags and three lags. We use industry fixed effects and Driscoll-Kraay (1998) standard errors. We control for the same macroeconomic variables as in Table 3. The results are reported in Panel A of Table 4. The first column shows results from regressing the smoothed equally-weighted average of industry IV on five lags of percentage changes in the number of listed firms and on macroeconomic control variables. We see that all five lags have positive coefficients and three are statistically significant. The lag coefficients follow an inverted U where the peak is at lag $t-3$. The sum of the lag coefficients is 0.279 and is significant at the 1% level. It follows that smoothed industry IV is positively related to past percentage changes in the number of listed firms. In the second column, we estimate the same regression but omit the first two lags since these lags overlap with the lags used to compute the smoothed average IV. We find that the three coefficients on the lags are positive and two are significant. The sum of the coefficients is 0.186 and is significant at the 1% level. In the third and fourth columns, we estimate the same regressions using the smoothed value-weighted average IV. The lag coefficients are all positive. Three lag coefficients are significant in Column (3) and the lag coefficients follow an inverted U as in Column (1). Two coefficients are significant in Column (4). In Column (3), the sum of the coefficients is 0.219 and it is significant at the 5% level. In Column (4), the sum is 0.151 and it is also significant at the 5% level.

We have also conducted the regression analysis where the dependent variable is constructed from the IV of old firms. With the creative destruction explanation, we would expect an increase in the number of listed firms to impact the IV of old firms. We find that this is the case. The sum of the lag coefficients is significantly positive in the regressions using equally-weighted smoothed IV and value-weighted smoothed IV.

In the Internet Appendix, we provide an extensive set of robustness checks. First, in Panel A of Internet Appendix Table 2, we change our definition of old firms so that old firms are firms listed for more than ten years (and by necessity the sample period to 1983-2020). Our conclusions are similar to those from Panel A of Table 4. In Panel B, we exclude the years from 1998 to 2003. These years are the peak years for IV and correspond to a period that some describe as the top of Internet and TMT bubble. The results are similar. In Panel C, we show results without controlling for macroeconomic variables. The results for the value-weighted average of IV are not significant, but the results for the equally-weighted average of IV are stronger than in Panel A of Table 4. In Panel D, we remove the TMT firms. We follow Ritter and Loughran (2004) to identify the SIC codes for TMT firms. The results are similar. Finally, we remove the crisis periods in Panel E. The results are similar for the equally-weighted average of IV but insignificant for the value-weighted average of IV. It follows from these checks that the equally-weighted average results are extremely robust, but the value-weighted average results exhibit some sensitivity. It is probably not surprising that the value-weighted average results are not as strong as the equally-weighted average results in that the value-weighted average reflects the IV of the largest firms in an industry. These firms are likely to be more resistant to disruption.

Two identification concerns seem relevant. First, an anticipated increase in an industry's IV could cause firms to go public. Second, an increase in an industry's IV could result from some variable that also affects the number of firms going public. These concerns could seem far-fetched for the longer lags, but they are not necessarily far-fetched for the shorter lags. Note that by this reasoning, it is unlikely that these concerns apply to the regressions reported in Columns (2) and (4). To address these concerns, we use instruments for the percent change in the number of public firms in an industry. We simplify the regressions so that the

regressor is the cumulative percentage change in the number of firms over five lags. Our instruments for this cumulative change is the percentage change in the number of firms in industries that are adjacent to the focal industry for the past five-year period and the lagged by one year past five-year period. Instrumenting using adjacent industries is used in Hoberg and Phillips (2025). Since we are using the Fama-French 48 industries, we consider adjacent industries to be the industries in the same Fama-French 12 industry as the focal industry.⁷ We show the first-stage regressions in Internet Appendix Table 3. The F-tests for the instruments are strong. The second-stage regressions are reported in Panel B of Table 4. We report tests for underidentification, overidentification, and weak instruments. Our instruments pass all three tests. As in Panel A of Table 4, we use industry fixed effects and control for macro variables. We do not report the coefficients on the macro variables. The estimated regressions for the smoothed equally-weighted average IV show positive coefficients significant at the 1% level. Turning to the estimated regressions for smoothed value-weighted average IV, the coefficients are positive and significant at the 10% level. In Internet Appendix Table 4, we report estimates where we use different approaches to construct the set of industries used for the instruments. Table 4 shows results when we use a broader set of industries from the Fama-French twelve and five industries classifications or a narrower set of industries using the Fama-French twelve industries and thirty-eight industries. Panel A shows results from the first stage regressions and Panel B shows results from the second stage regressions. The results are consistent with our inferences from Table 4.

It follows from this analysis that changes in an industry's average IV are strongly related to changes in the number of firms in the industry. Importantly, the same is the case for the average IV of the old firms in an industry. We now turn to show that indicia of creative destruction are higher following greater arrival of new firms.

⁷ A difficulty that arises in some cases is that firms in one of the Fama-French 48 industries can be in multiple Fama-French 12 industries. To deal with that issue, we use a weighted average of the percent change in firms in the relevant Fama-French 12 industries where the weights are based on the distribution of the firms in the focal Fama-French 48 industry.

6. New Lists and Creative Destruction

In this Section, we first show that variables that proxy for creative destruction are correlated with IV. We then show that creative destruction is related to past changes in listings. Lastly, innovation plays a critical role in creative destruction. We show evidence of that role.

6.1. Creative Destruction and IV

Creative destruction means that new firms entering an industry cause existing firms to either compete and adapt or lose. We therefore expect more cross-sectional variability in performance and investment within an industry if there is more creative destruction. For our reasoning to be correct, we must show that there is a relation between average IV and our indicia of creative destruction. With creative destruction, some firms grow as they take advantage of new technologies and new processes. Firms that are set in their ways and have older technologies and older processes that cannot adapt lose out. As a result, we expect greater cross-sectional variability among firms in an industry during episodes of greater creative destruction. We therefore use as indicia of creative destruction measures of cross-sectional variability of operating income to assets and investment to assets. We use annual data at the industry level and regress the average industry IV on industry indicia of creative destruction and industry fixed effects. Table 5 shows that there is a strong relation between our indicia of creative destruction and average IV at the industry level. We find in all cases a positive significant coefficient, so that more creative destruction is accompanied by higher IV. This result holds for both equal-weighted IV and value-weighted IV. It holds for contemporaneous values of indicia of creative destruction as well as for lagged values.

We now turn to regressions of the five-year percentage change in the indicia of creative destruction on five lags of the percent change in the number of listed firms and macro variables. We show the results in Table 6. We use Driscoll and Kraay (1998) standard errors with five lags and industry fixed effects. We show results for the whole sample first and then for old firms. Starting with the whole sample, we first report the regression for the standard deviation of operating income to assets in Column (1). The coefficients for all lags are positive. The sum of the coefficients is positive and significant at the 10% level. We then

report the results for the standard deviation of investment to total assets in the second column. We have large significantly positive coefficients for the first two lags. All lags have positive coefficients and the sum of the coefficients for the lags is positive and significant at the 1% level.

Creative destruction brought about by young firms entering the market should affect old firms. We investigate whether indicia of creative destruction of old firms are related to lags of percent changes in the number of listed firms. We find that the percentage change in the standard deviation of operating income over assets for old firms over the past five years is positively related to the new list annual rates over those five years (third and fourth columns of Table 5). All coefficients are positive and three lags have coefficients significant at the 5% level. The sum of the coefficient is significant at the 1% level. Lastly, we find similar, but statistically stronger, results for the standard deviation of investment to total assets for old firms.

Another approach to show that the greater arrival of new firms leads to more creative destruction is to examine whether more firms are delisted following the arrival of more new firms. We show in Table 7 regressions of delists in year t scaled by the number of listed firms at $t-1$ regressed on five lags of the percentage changes in listings using the whole sample first. We control for macro variables and use industry fixed effects. Standard errors are clustered by industry and year. We find a strong positive relation between new lists and future delists since the sum of the coefficients on the listing variables is positive and significant. However, this evolution might reflect the arrival of weak new lists that die quickly (Fama and French, 2004). We therefore repeat our estimation focusing on old firms instead (second column). Now, the dependent variable is the sum of delists of old firms for year t on the percentage changes in listed firms for five lags. We again find a strong relation.

As discussed in the introduction, the literature on creative destruction often looks at the turnover of the top firms in an industry as evidence of creative destruction. We use this measure in Table 8. We rank firms by sales within industries at time t . We then rank firms again at time $t+j$ and measure the fraction of firms ranked in top three (or top five) at t that are still ranked in top three (or top five) at $t+j$. The degree of creative destruction is inversely related to that fraction. We examine time spans (j) of three years and five years. We estimate regressions of the fraction of firms still in the top ranking at $t+j$ on five lags of the

percentage of new lists and macroeconomic variables for controls. We use Driskoll-Kray standard deviations with five lags. We estimate the regressions for all industries and then for industries with at least 20 firms. We expect the coefficient on the lags to be negative if the arrival of more firms to the market causes more creative destruction, i.e., fewer firms in the top three or top five ranks are still in those ranks three years later. When we include all firms, we find that turnover increases (i.e., more churn in the top ranked firms and hence negative coefficients on the lags) with the percentage change in the number of firms significantly at the 5% level for the five-year horizon and increases significantly for the three-year horizon when we use the top five firms but not the top three firms. When we require 20 firms per industry, we find that turnover increases significantly for all regressions.

In this Section, we have shown that there is a tight connection between the increase in listings and creative destruction. Importantly, we have also shown that creative destruction occurs among old firms and among the top firms in industries.

6.2. Innovation, Listed firms, and Creative Destruction

Innovation plays a key role in the Schumpeterian creative destruction. In this section, we first show that innovation by other firms in an industry increases the IV of focal firms. We then show that greater increases in the number of listed firms in an industry leads to more increases in innovation in that industry. Lastly, we show that there is a connection between innovation and creative destruction.

With creative destruction, we expect innovation by other firms to affect the idiosyncratic volatility of the focal firm. We estimated models of the determinants of firm idiosyncratic volatility in Table 3. We now augment these models with innovation proxies for other firms in the focal firm's industry. To compute these proxies, we follow Kogan, Papanikolaou, Seru, and Stoffman (2017) and use the value created through the granting of patents.⁸ They estimate the value created by the granting of patents using an event study and normalizing by the firms' total assets. We construct the variable Nominal Patent Value/Total Assets Others. For this measure, we sum Nominal Patent Value across firms other than the focal firm in the industry of the

⁸ We use the dataset made available by Professor Noah Stoffman at <https://www.stoffprof.com/>.

focal firm and divide by the sum of Total Assets of these firms. Our second innovation proxy is the ratio of R&D/Total Assets for the same firms. We construct the ratio by summing R&D across firms and dividing by the sum of Total Assets. We also construct these two proxies for the focal firm. The literature on innovation also uses the number of patents, patent citations, and weighted patent citations as proxies for innovation (Kogan, Papanikolaou, Seru, and Stoffman, 2017). The issue with patent citations and weighted patent citations is that they are not observable at date t . The citations of patents granted at date t accumulate after date t . Since we are looking at a market measure at date t , we do not include measures that become known after date t .

In Table 9, we show the estimation results with these variables added to the base specification of Table 3. Note that in our base specification in Table 3, we include R&D/Total Assets. We do the same here. We find that the IV of the focal firms is positively related to the value created by patents by the other firms in the industry. This is the case for young firms, old firms, and for the whole sample. We find that the IV of the focal firms also increases with the R&D expenditures of the other firms in the industry except for young firms. Surprisingly, adding the innovation proxies for other firms in the industry renders the focal firm's R&D expenditures insignificant. However, the value created by patents for the focal firm is positively related to its IV, albeit with a very small coefficient compared to the same measure for the other firms. This evidence is largely consistent with the prediction of the creative destruction explanation, namely that more innovation creates more uncertainty and hence increases IV.

With our creative destruction explanation, we would expect that innovation is positively related to the percentage change in listed firms. We investigate this hypothesis in Table 10. In this table, we introduce citation measures.⁹ First, we use the scaled citation share of firms in an industry. To compute that measure, we sum the citations accruing to patents granted in year t to firms in an industry and divide by the total sum of citations accruing to patents granted in year t . Since the regressions are estimated with industry fixed effects, we are effectively measuring whether this share is high for an industry in a particular year compared

⁹ The data is again from the website of Professor Noah Stoffman (<https://www.stoffprof.com/>).

to other years. Second, we use the citation weighted measure of Kogan, Papanikolaou, Seru, and Stoffman (2017). This measure is the number of patents granted to an industry in a year adjusted for the number of citations of these patents compared to other patents granted that year. We are dividing citation and patent measures by the sum of total assets of all firms in the industry in that year.

We show the results for the cumulative measures of innovation over three years. Specifically, we estimate regressions with these measures summed over three years on lagged percentage increases in the number of public firms and macroeconomic variables. We use industry fixed effects and Driscoll-Kraay (1998) standard errors with five lags. As before, we control for macroeconomic variables. We show results for a sample including all industries and a sample including only industry years with at least twenty firms. There is no evidence that the value created through patent grants is related to lagged percent changes in the number of firms. This may not be surprising in that the value created is sensitive to right-tail values. These values are likely to be quite random over time. We find, for the whole sample, that the citation measures are positively related to the increase in listed firms in an industry. Further, R&D expenditures of an industry is positively related to the change in listed firms in an industry. These results are consistent with the prediction that innovation is higher following increases in the number of public firms.

Lastly, we show that turnover in the top firms in industries is related to innovation. To show this, we regress our turnover measures of Table 8 on innovation proxies at $t-1$. We show the results for the whole sample of industries and for industries with more than twenty firms in Table 11. We use macroeconomic variables as controls and cluster the standard errors by industry and year. We show results for the value creation measures and R&D. Again, these variables are observable at t while the citation measures are not. For all firms in an industry, we find that the value creation measure is not significant. The R&D measure has a negative coefficient in all cases that is significant in three regressions out of four.

Our findings in this Section are that creative destruction is related to industry innovation and that innovation is positively related to past percentage change increases in the number of firms. Hence, greater growth in the number of public firms in an industry is associated with more innovation and more creative destruction.

7. Is There Something Special about New Public Firms?

So far in this paper, we have focused on the number of listed firms and changes in the number of listed firms. Therefore, we cannot tell whether creative destruction results from the arrival of new firms listed on the stock market or from the creation of new firms in general. Suppose that a constant fraction of new firms created eventually goes public. With our regressions, the listing rate could proxy for the aggregate rate of firm creation at an earlier time. In this case, our results would not be about listed firms but about aggregate firm creation. Whether a firm is listed or not would not affect creative destruction. We therefore investigate whether the aggregate rate of firm creation has information for the average IV of public firms that the percentage change in listed firms does not have and whether it affects the creative destruction proxies for public firms.

We use data from the U.S. Census Bureau's Statistics of U.S. Businesses (SUSB) to measure the number of firms in the economy.¹⁰ With these data, we can only compute the net change in the number of firms and cannot compute separately the number of firms created and the number of firms that died. Most non-public firms have few employees, so that it would not make sense for them to be listed and it would be improbable that they would have a creative destruction impact. It is not clear, however, what the size threshold should be for our analysis. We conduct our analysis with two different thresholds: 20 and 100 employees. Panel A of Figure 3 plots the number of Census firms using the 20-employee threshold and the equal-weighted average IV. We see that the number of Census firms evolves very differently from the number of listed firms. There is no inverted-U shape. The number of Census firms at the end of our sample period is substantially larger than the number of Census firms at the beginning of our sample period. Panel B of Figure 3 uses the 100-employee threshold and shows similar results.

To examine whether there is a relation between average IV and the number of Census firms, we estimate separate regressions with levels and percentage changes of smoothed average IV (using a five-year moving

¹⁰ For additional details of this data set see <https://www.census.gov/programs-surveys/susb.html>.

average) and the aggregate number of firms like we did in Table 2. These regressions use annual data; the standard errors are Newey-West with five lags. We use alternatively the 20-employee threshold and the 100-employee threshold. Panel A of Table 12 replicates the regressions of Table 2 with the addition of Census variables. The dependent variable is the five-year smoothed average IV. We use macroeconomic variables as controls but do not tabulate the coefficients. In the first five columns, we use the equal-weighted average. We show the results for regressions with dependent and independent variables in levels (percent changes) in the top (bottom) panel. We start with a discussion of the results for levels. In Column (1), we use the level of the number of listed firms at lag 3. We find a significant positive coefficient and an adjusted R-squared of 77%. In Column (2), we use the level of the number of Census firms at lag 3 using the 20-employee threshold. The coefficient is statistically insignificant, and the regression has low explanatory power. Results in Column (3) for Census firms with at least 100 employees are similar. Lastly, in Columns (4) and (5) we include the number of public firms and the number of Census firms. Both the number of public and Census firms are significant, but the increase in the adjusted R-squared of Column (1) from adding the number of Census firms is trivially small. It follows that there is no evidence of a relation between average IV and the number of Census firms in regressions that use only the number of Census firms. While the number of Census firms is significant in regressions that also include the number of listed firms, its explanatory power is minimal. In the next five columns of Panel A of Table 12, we re-estimate the regressions using the smoothed value weighted IV as the dependent variable. In these regressions, the coefficients on listed firms are always significant and the coefficients on listed firms are never significant. Turning to the percentage change results, we find that both the percentage change in the number of listed firms is always significant and the percentage change in the number of Census firms is never significant. It follows from this evidence that there is no relation between the change in average IV and the change in the number of Census firms at the three-year lag.

We now supplement the regressions of Panel A of Table 4 using Census data at the industry level in Panel B of Table 12. The Census makes data available at the 4-digit NAICS industry level. We map NAICS-4 industries to the SIC-4 industries most common among firms with the same non-missing NAICS-4 code.

If we cannot find a mapping for NAICS-4, we alternatively use mappings based on the most common SIC-4 code for 3-digit, 2-digit, or 1-digit NAICS codes, respectively. Subsequently, we map 4-digit SIC codes into the 48 Fama-French industries used earlier. The dependent variable in our regressions is the percentage change in the five-year moving average of IV centered at t . We use yearly observations. We show results for five yearly lags and three yearly lags in turn. We estimate our regressions for the 20-employees threshold and for the 100-employee threshold.

When using equal-weighted IV and the 20-employee threshold for Census firms, we find that the sum of the lags is significant whether we use five lags or three lags. However, the adjusted R-squared is almost twice as high for the regressions using listed firms. The results are weaker when we use the 100-employee threshold. In that case, the sum of the lags is significant for five lags but not three. When we include both lags for the percentage change in listings and lags for the percentage change in Census firms, we find that the sum of the coefficients is significant for Census firms for five lags when the threshold is 20 employees and when it is 100 employees, while it is never significant when we use only three lags. In contrast, the sum of the coefficients for listed firms is always significant. Results using value weighted IV are generally weaker.

We also examine whether the percentage changes of Census firms are related to our measures of creative destruction from Table 6. We show estimates of regressions where lag percentage changes of Census firms are added to the regressions of Table 6 in Table 13. We find that the sum of the coefficients for the lag percentage changes of Census firms are insignificant for the Standard Deviation of Operating Income/Total Assets. While the sum of the coefficients for the lag percentage changes of Census firms are significant for the Standard Deviation of Investment/Total Assets, the sum of the coefficients is negative. The sum of the coefficients for lag percentage changes of listed firms is significant in all regressions. It follows that adding lag percentage changes of census firms does not alter our inferences about the relation between the measures of creative destruction and public firms. Further, there is no evidence that creative destruction is positively related to past percentage changes of census firms.

It could be that private firms in aggregate or at the industry level have no effect on creative destruction, but a subset of such firms has an effect. In particular, many private firms that meet our size thresholds may just fill a regional need and hence will not impact firms that are focused on a national market. Hence, it would be good to distinguish between private firms that are more likely to impact their industry and other private firms. One approach is to focus on startups that have VC-funding. We create a database of all VC-funded startups from Pitchbook. This database comes with an important caveat, as it does not account for exits. We use the lagged percentage changes in the number of startups. We then re-estimate the regressions of Panel B of Table 12. We show results in Internet Appendix Table 5. The sum of the coefficients for the lagged of percentage change in the number of startups is insignificant in all regressions we estimate. We examine the relation between the change in the number of VC firms and measures of creative destruction and do not find any statistically significant results (IA Table 6).

Overall, the results in this section show that the relation between the percentage change in IV and the percentage change in the number of listed firms holds up when we add the percentage change in the number of Census firms to the regression. While the percentage change in the number of Census firms is significant in some regressions, the results are not consistent and generally the explanatory power of the percentage change in the number of Census firms is low compared to the explanatory power of the percentage in the number of listed firms. We also fail to find a reliable relation between the number of Census firms and our measures of creative destruction. Finally, we reach the same conclusions if we use the number of VC-funded startups instead of the number of Census firms. Together these results suggest that changes in the number of listed firms play an important role in creative destruction.

8. Conclusion

In this paper, we document that there is a close connection between the number of public firms and idiosyncratic volatility. We show that this relation is not spurious. It is not due to young firms or to the period around the Internet bubble. We then proceed to explain this relation. We argue that when more firms enter the markets, there is more creative destruction. With more creative destruction, the value of incumbent

firms is more uncertain, so that their idiosyncratic volatility is higher. This is the case for older firms since these older firms might be challenged by the firms that enter the markets. We find that this is the case at the industry level. Further, at the industry level, greater past growth in listed firms implies greater cross-sectional variation in operating performance and investment. Again, we find that this result holds when we consider only older firms. Further, we find that with more creative destruction, old firms are more likely to delist. A common measure of creative destruction is turnover of the most highly ranked firms. We rank firms by sales and we find that turnover among the top firms ranked by sales in an industry is positively related to past percentage changes in the number of listed firms. Innovation plays a key role in Schumpeterian creative destruction. We show that innovation is higher when more firms arrive to public markets and that turnover of the most highly ranked firms is positively related to innovation.

Our evidence shows a strong connection between changes in the number of public firms and creative destruction, but we fail to find evidence of an equally strong connection between changes in the number of Census firms and creative destruction or between the number of VC-funded startups and creative destruction. With the data available to us, we must leave a full explanation of the role of public markets for creative destruction to future work. However, our study provides useful indications about the importance of the availability of the IPO exit for private firms for creative destruction. The peak number of public firms during our sample period is approximately 7,500. The peak number of Census firms with more than 20 employees is approximately one hundred times higher, or 740,000. The peak number of Census firms with more than 100 employees is approximately 190,000. The firms that are public are therefore a tiny fraction of the Census firms. They are not selected randomly. Most private firms are unlikely to threaten public firm incumbents. Rather, these firms fill in geographic or industry niches. For instance, a new dry-cleaning operation with 30 employees and several stores might be created. It would have no measurable impact on established public firms. To explain our evidence, it must be that the firms that go public have a much higher likelihood of generating creative destruction than the firms that stay private. This result raises two questions about the role of public firms. First, why is it that firms that are more likely to contribute to

creative destruction choose to go public? Second, do these firms contribute more to creative destruction because they go public?

Existing literature suggests that the firms that contribute more to creative destruction are likely to be venture funded. It is also the case that venture-funded firms seek an exit that enables their funders to cash out. Startups that contribute more to creative destruction may be more likely to exit through an IPO to maximize the value of their business model since incumbents may not want to acquire a firm that could be internally disruptive. With this view, there is a close connection between the ability of firms to exit through an IPO and creative destruction, and it provides further support to Black and Gilson (1998) who argue that a healthy public market is key for a healthy venture industry. Absent the availability of an IPO exit, we would see fewer startups that contribute much to creative destruction.

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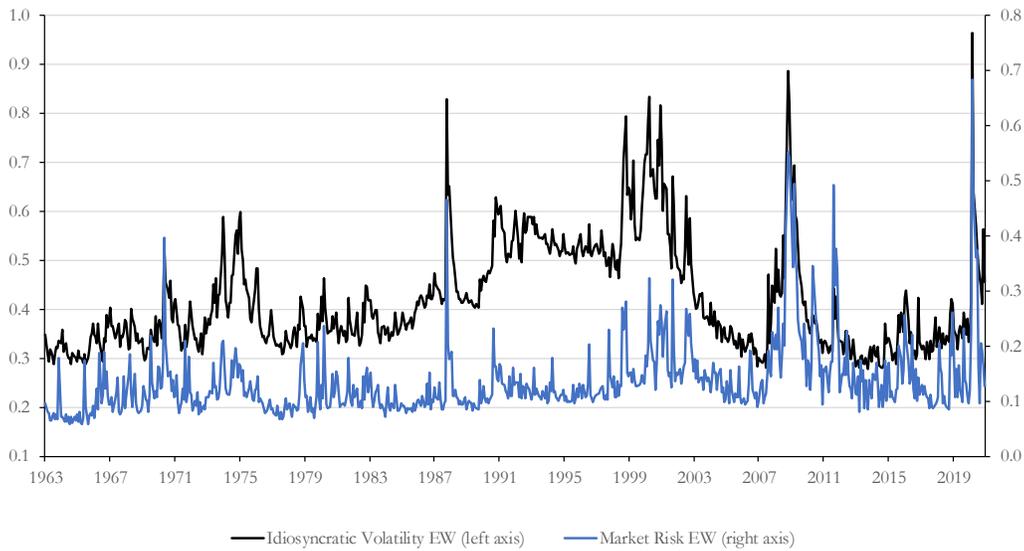
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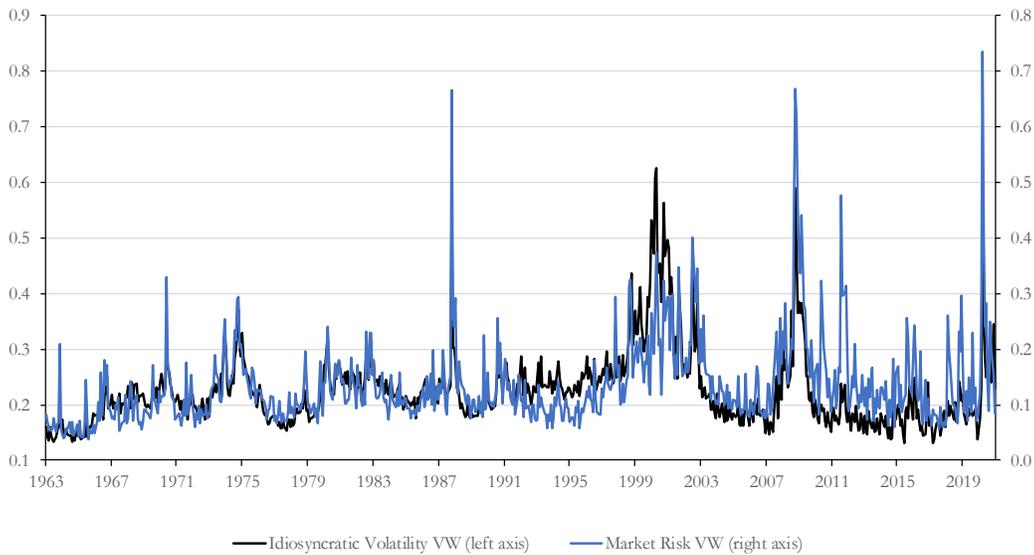
Figure 1: Idiosyncratic Volatility and Listings over Time

The figure shows monthly aggregate average idiosyncratic volatility (IV) for U.S. firms over time. In particular, Panels A and B show monthly equal- and value weighted averages, while Panels C and D show centralized, 5-year moving averages of equal- and value weighted IV, respectively. Panels A and B also show monthly equal- and value weighted averages of market risk from the market model, while Panels C and D also show the number of listed firms. IV is estimated using the market model for each month using daily returns. Average IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The number of listed firms is the number of common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar month. The sample period is 1963 to 2020.

Panel A: Equal-weighted Idiosyncratic Volatility and Market Risk



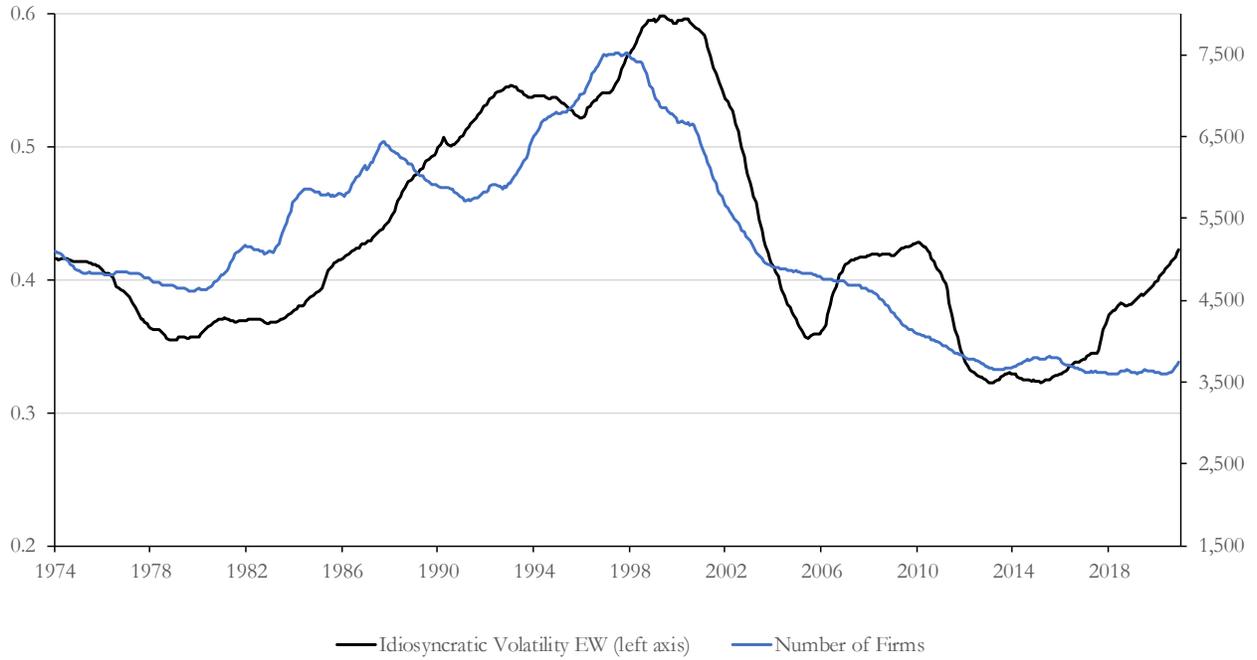
Panel B: Value weighted Idiosyncratic Volatility and Market Risk



(continued)

Figure 1: Idiosyncratic Volatility and Listings over Time (continued)

Panel C: Smoothed Equal-weighted Idiosyncratic Volatility and Number of Listed Firms



Panel D: Smoothed Value weighted Idiosyncratic Volatility and Number of Listed Firms

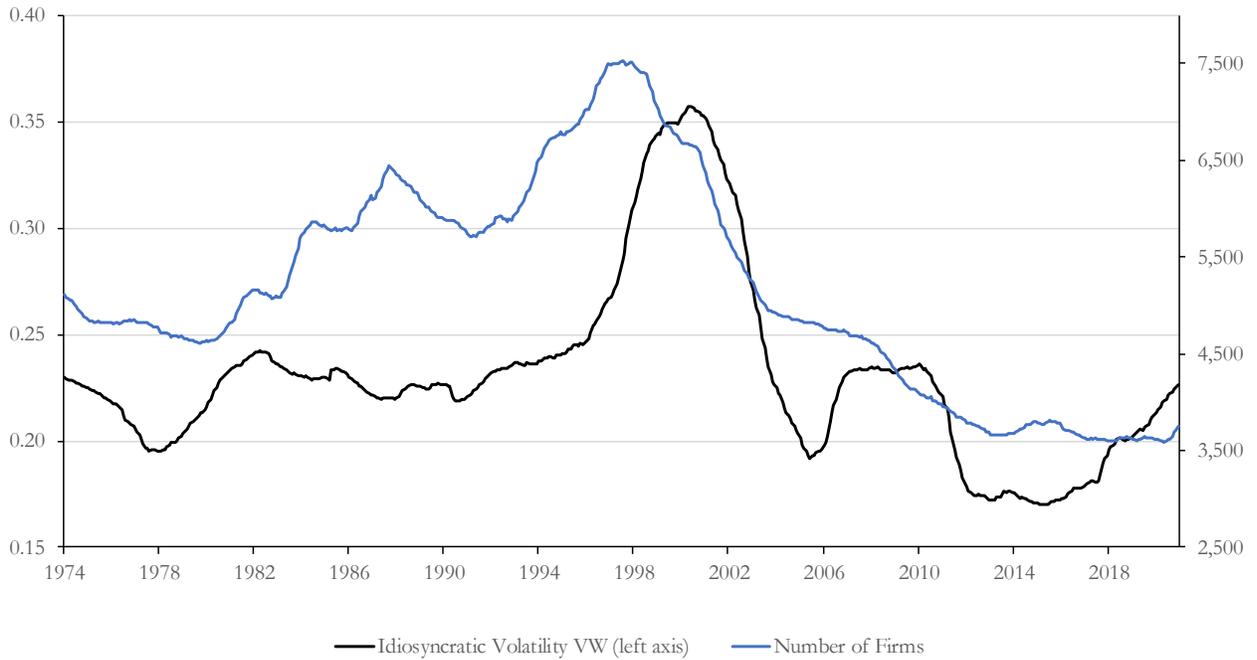
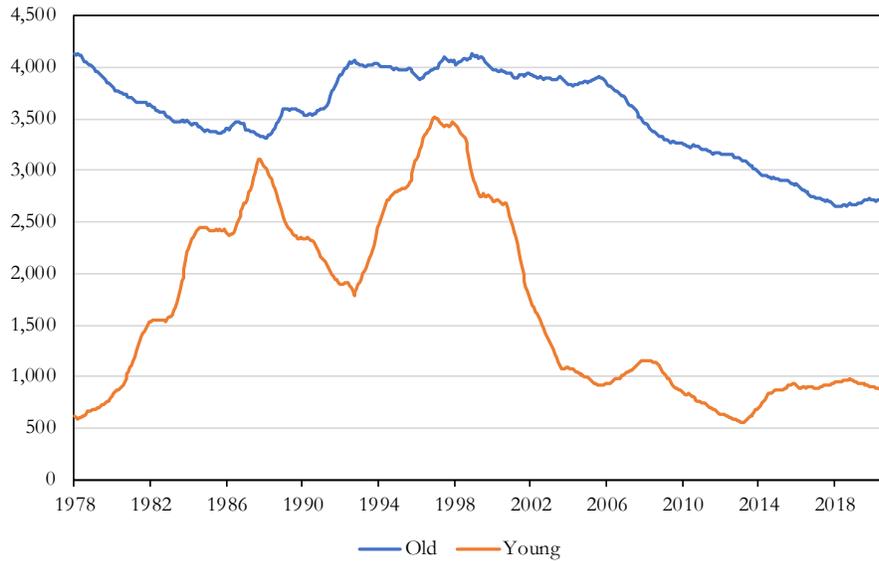


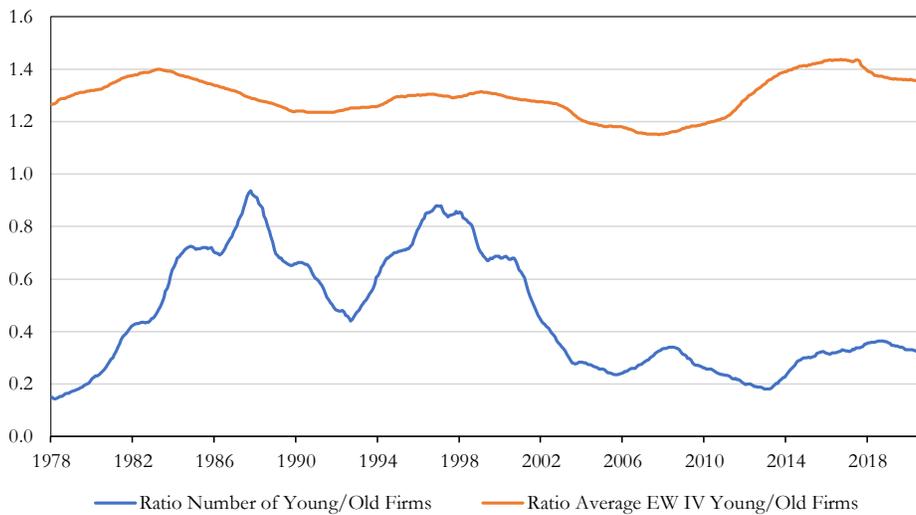
Figure 2: Number, Fraction, and IV of Young Firms vs. Old Firms

The figure shows centralized, 5-year moving averages of monthly idiosyncratic volatility (IV) as well as the fraction and number of young and old firms over time. In particular, Panel A shows the number of listed firms separately for young firms and old firms. Panel B shows the ratio of the number of young and old firms and the ratio of the equal-weighted IV of young and old firms. Panel C shows the average equal-weighted IV of young and old firms. Panel D shows the average value weighted IV of young and old firms. IV is estimated using the market model for each month using daily returns. IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The number of firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar month. Young firms are firms with age of less or equal to 5 years; old firms are firms with age greater than 5 years. The sample period is 1978 to 2020.

Panel A: Number of Firms



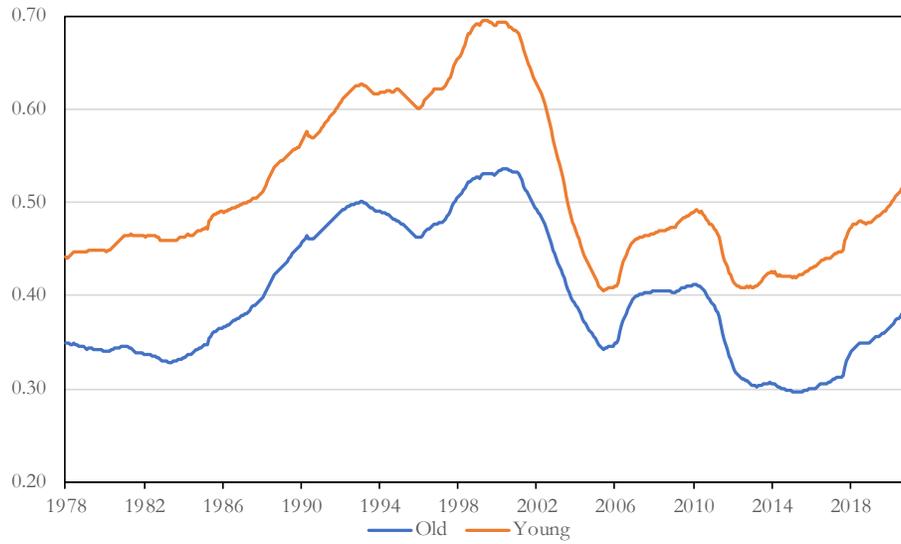
Panel B: Ratio of Number and EW IV of Young and Old Firms



(continued)

Figure 2: Number, Fraction, and IV of Young Firms vs. Old Firms (continued)

Panel C: Equal-weighted Idiosyncratic Volatility



Panel D: Value weighted Idiosyncratic Volatility

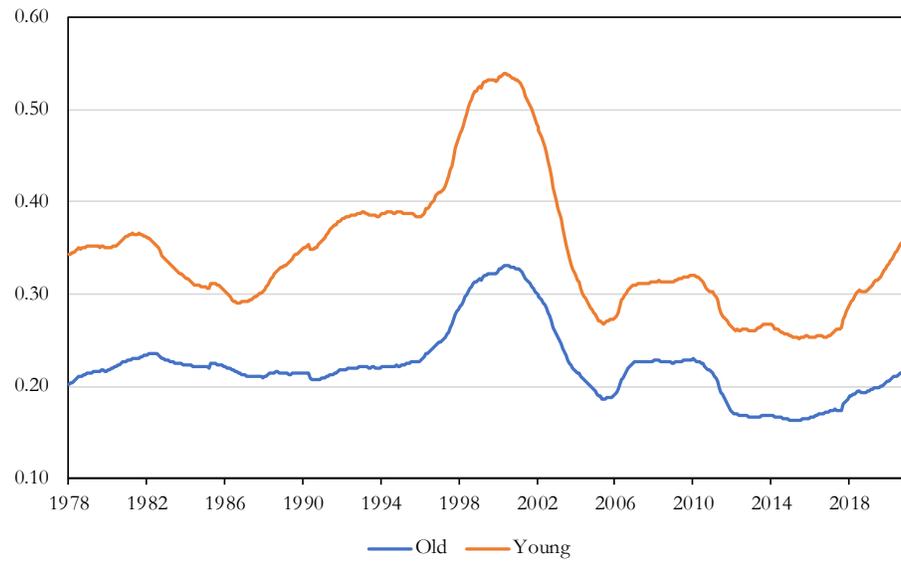
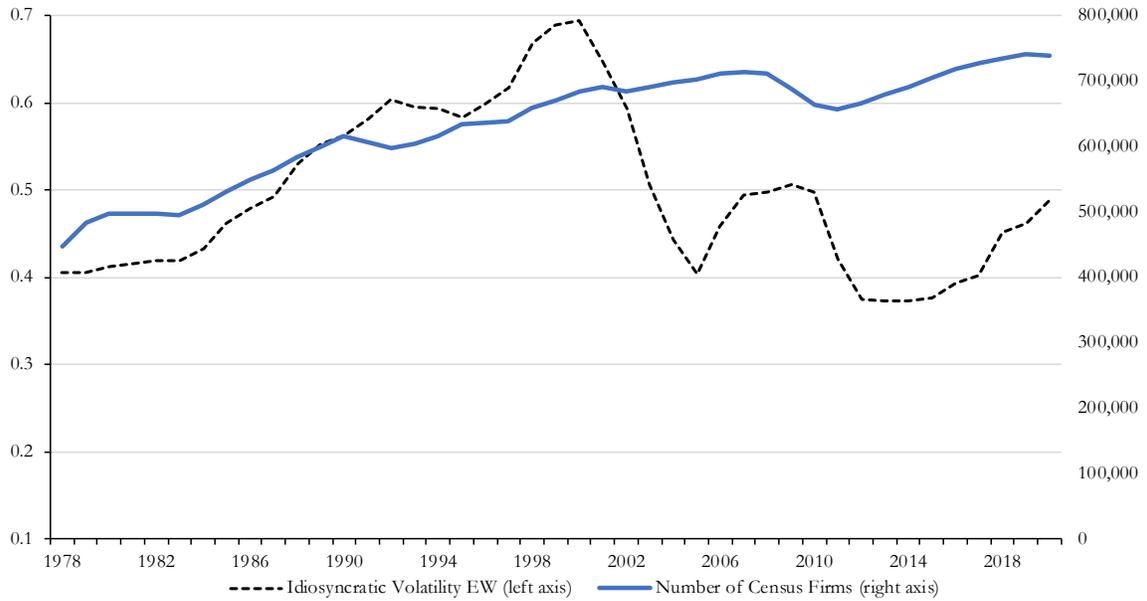


Figure 3: Idiosyncratic Volatility and Number of Census Firms over Time

The figure shows annual idiosyncratic volatility (IV) of listed firms and the number of Census firms over time. IV is estimated using the market model for each calendar year using daily returns. The figure shows the centered, 5-year moving average of equal-weighted IV. It also shows the annual number of Census firms with at least 20 (Panel A) and 100 (Panel B) employees reported by the U.S. Census, respectively. IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The sample period is 1978 to 2020.

Panel A: Census Firms with at least 20 Employees



Panel B: Census Firms with at least 100 Employees

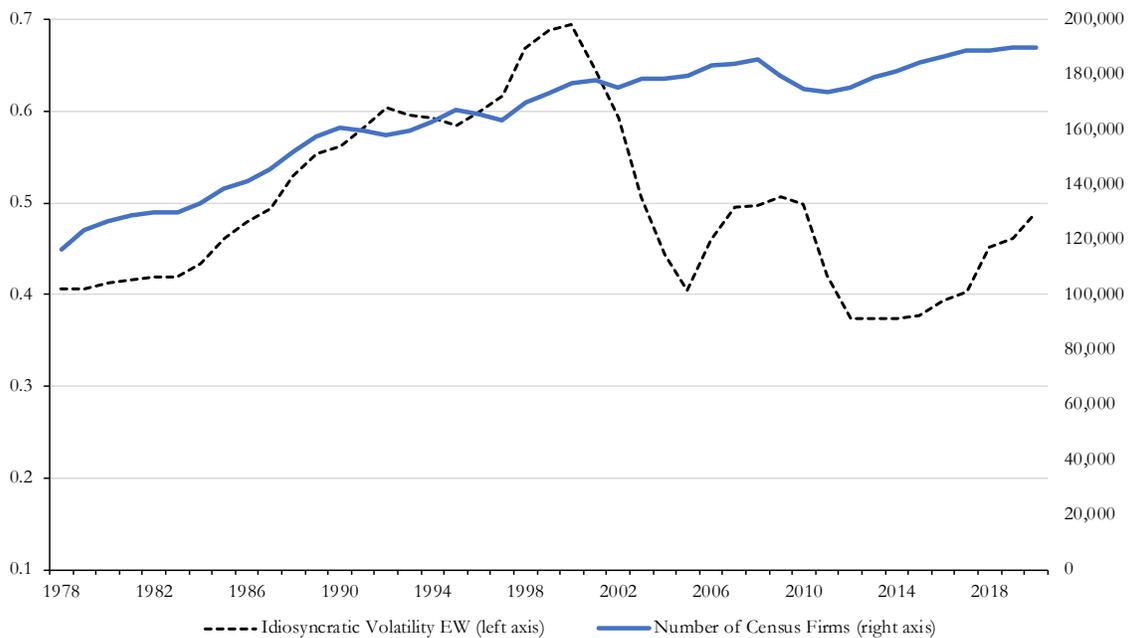


Table 1: Time-Series Regressions of Idiosyncratic Volatility and Number of Firms

The table shows results from time-series regressions with equal- and value weighted idiosyncratic volatility (IV) and the number of listed firms. In Panel A, the monthly equal- or value weighted average of the natural logarithm of IV is regressed on the number of listed firms, (the natural logarithms of) dispersion in real market capitalization, and a range of macro variables, namely the equal- or value weighted average of the natural logarithm of market risk from the market model, the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. IV and market risk are estimated using the market model for each month using daily returns. Regressors are alternatively contemporaneous or lagged. In Panel B, the annual levels or percentage changes in equal- and value weighted centralized, 5-year moving averages of IV are regressed on the levels and percentage changes of the number of firms lagged by 3 years with standard errors based on Newey-West (1987) with 5 lags. IV is estimated using the market model for each calendar year using daily returns. The table reports regression coefficients and associated *p*-values, the regression (adjusted) R-Squared, and the number of observations. IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The number of listed firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar month or year. The dispersion in real market capitalization is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) at of the end of the calendar year. The sample period is 1978 to 2020.

Panel A: Number of Firms

	Contemporaneous Regressors				Lagged Regressors											
	Equal-weighted IV		Value-weighted IV		Equal-weighted IV		Value-weighted IV									
	Coef	<i>p</i> -value	Coef	<i>p</i> -value	Coef	<i>p</i> -value	Coef	<i>p</i> -value								
Number of Firms			0.189	[0.00]	0.178	[0.00]	0.190	[0.00]	0.179	[0.00]						
Dispersion Real Market Cap (log)	-0.116	[0.00]	0.021	[0.03]	-0.112	[0.00]	0.016	[0.20]	-0.088	[0.00]	0.049	[0.00]	-0.077	[0.00]	0.052	[0.00]
Market Risk (log)	0.305	[0.00]	0.236	[0.00]	0.243	[0.00]	0.178	[0.00]	0.212	[0.00]	0.143	[0.00]	0.128	[0.00]	0.063	[0.02]
Credit Spread	-0.042	[0.02]	0.038	[0.00]	0.009	[0.65]	0.084	[0.00]	-0.042	[0.03]	0.038	[0.00]	0.014	[0.50]	0.090	[0.00]
NBER Recessions	0.110	[0.00]	0.147	[0.00]	0.167	[0.00]	0.202	[0.00]	0.135	[0.00]	0.172	[0.00]	0.194	[0.00]	0.228	[0.00]
Chicago Fed Index	-0.005	[0.59]	-0.010	[0.09]	-0.005	[0.68]	-0.009	[0.28]	-0.005	[0.63]	-0.010	[0.15]	0.003	[0.77]	-0.001	[0.93]
CRSP VW-Return	0.370	[0.12]	0.191	[0.16]	-0.092	[0.72]	-0.261	[0.16]	-0.247	[0.32]	-0.428	[0.01]	-0.673	[0.01]	-0.844	[0.00]
Intercept	0.791	[0.00]	-1.752	[0.00]	-0.063	[0.76]	-2.453	[0.00]	0.312	[0.12]	-2.238	[0.00]	-0.670	[0.00]	-3.074	[0.00]
Adjusted R ²	0.23		0.75		0.24		0.61		0.16		0.68		0.16		0.54	
Observations	516		516		516		516		515		515		515		515	

(continued)

Table 1: Time-Series Regressions of Idiosyncratic Volatility and Number of Firms (continued)

	Panel B: Moving Averages							
	Equal-weighted IV				Value-weighted IV			
	5-year Central Moving Average		Percent Change of 5-year Central Moving		5-year Central Moving		Percent Change of 5-year Central Moving Average	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Number of Firms ($t-3$)	0.070	[0.00]			0.037	[0.00]		
Percent Change Number of Firms ($t-3$)			0.624	[0.01]			0.637	[0.10]
Intercept	0.130	[0.02]	0.010	[0.31]	0.070	[0.13]	0.006	[0.65]
R ²	0.75		0.21		0.62		0.13	
Observations	40		39		40		39	

Table 2: Time-Series Regressions with Multiple Lags and Listing Variables

The table shows results from time-series regressions of equal- and value weighted idiosyncratic volatility (IV) on alternative listing variables. It regresses the percentage change in the centered, 5-year moving average of annual equal- or value weighted IV on the percentage change in the number of listed firms for lags of 1 to 5 years. IV is estimated using the market model for each calendar year using daily returns. Standard errors are based on Newey West (1987) with 5 lags. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. The table reports regression coefficients and associated p -values, the regression R-Squared, and the number of observations. It also reports the sum of the coefficients of the listing variables, and a test of it being equal to zero. IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The number of firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar month or year. The sample period is 1978 to 2020.

	Percentage Change in 5-year Central Moving Average of IV (t)							
	Equal-weighted IV				Value-weighted IV			
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Percent Change Number of Firms ($t-1$)	-0.025	[0.91]			-0.144	[0.70]		
Percent Change Number of Firms ($t-2$)	0.597	[0.02]			0.827	[0.03]		
Percent Change Number of Firms ($t-3$)	0.203	[0.47]	0.485	[0.14]	0.169	[0.61]	0.542	[0.16]
Percent Change Number of Firms ($t-4$)	0.134	[0.35]	0.160	[0.37]	0.139	[0.54]	0.148	[0.44]
Percent Change Number of Firms ($t-5$)	-0.069	[0.88]	0.000	[1.00]	-0.187	[0.73]	-0.092	[0.85]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.029	[0.52]	-0.031	[0.35]	-0.030	[0.54]	-0.029	[0.43]
Credit Spread ($t-1$)	-0.015	[0.60]	-0.033	[0.24]	-0.040	[0.18]	-0.065	[0.05]
NBER Recessions ($t-1$)	0.073	[0.15]	0.055	[0.41]	0.073	[0.23]	0.046	[0.56]
Chicago Fed Index ($t-1$)	-0.014	[0.55]	-0.024	[0.32]	-0.041	[0.02]	-0.057	[0.01]
CRSP VW-Return ($t-1$)	0.054	[0.46]	-0.017	[0.83]	0.061	[0.46]	-0.032	[0.71]
Intercept	-0.023	[0.86]	0.025	[0.83]	0.034	[0.82]	0.105	[0.46]
Sum Coef Listing Variables	0.841		0.645		0.805		0.598	
p -value (Test Sum of Coefficients)	[0.04]		[0.06]		[0.07]		[0.16]	
R ²	0.48		0.39		0.47		0.37	
Observations	37		37		37		37	

Table 3: Firm-level Panel Regressions of Idiosyncratic Volatility on Firm Characteristics

The table shows results from panel regressions of the natural logarithm of annual firm-level idiosyncratic volatility (IV) on the lagged number of listed firms, lagged macro-economic variables, and lagged firm characteristics. Panel A is based on young firms (age less than or equal to 5 years), while Panel B is based on old firms (age greater than 5 years). Panel C shows results for all firms. IV is estimated using the market model for each calendar year using daily data. The number of firms, credit spread, an indicator variable for NBER recessions, and the Chicago Fed Index are as of the last month of the calendar year, while the natural logarithm of market risk is the standard deviation of the monthly CRSP value weighted index return, and the CRSP value weighted return is cumulative over the year. The natural logarithm of the Amihud illiquidity ratio, SG&A expenses (scaled by total assets), R&D expenses (scaled by total assets), capital expenditures (scaled by total assets), and ROE are the average of the monthly values over the calendar year, while the natural logarithm of real market capitalization, the natural logarithm of firm age, the natural logarithm of Tobin's Q, leverage, PPE (net) (scaled by total assets), and the natural logarithm of cash and short-term investments (scaled by total assets) are as of the last month of the calendar year. The regressions include industry fixed effects. Standard errors are clustered by firm and year. The table reports regression coefficients and associated p -values, the adjusted regression R-Squared, and the number of observations. The sample consists of all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The number of firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3). The sample period is 1978 to 2020.

Panel A: Young Firms

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef	p -value										
Number of Firms ($t-1$)			0.177	[0.00]			0.117	[0.00]			0.142	[0.00]
Market Risk (CRSP VW Index) (log) ($t-1$)	0.156	[0.07]	0.023	[0.66]					0.094	[0.31]	-0.002	[0.97]
Credit Spread ($t-1$)	-0.098	[0.06]	0.069	[0.07]					-0.077	[0.19]	0.048	[0.34]
NBER Recessions ($t-1$)	-0.008	[0.96]	-0.046	[0.75]					-0.131	[0.49]	-0.132	[0.42]
Chicago Fed Index ($t-1$)	-0.080	[0.37]	-0.046	[0.50]					-0.132	[0.17]	-0.095	[0.23]
CRSP VW-Return ($t-1$)	0.109	[0.68]	-0.022	[0.90]					0.044	[0.88]	-0.036	[0.87]
Illiquidity Ratio (log) ($t-1$)					-0.001	[0.94]	-0.026	[0.03]	-0.003	[0.81]	-0.022	[0.04]
Real Market Capitalization (log) ($t-1$)					-0.125	[0.00]	-0.139	[0.00]	-0.128	[0.00]	-0.139	[0.00]
Firm Age (log) ($t-1$)					-0.035	[0.23]	-0.031	[0.20]	-0.033	[0.20]	-0.029	[0.19]
Tobin's Q (log) ($t-1$)					0.053	[0.02]	0.036	[0.06]	0.059	[0.00]	0.050	[0.00]
Leverage ($t-1$)					0.200	[0.00]	0.218	[0.00]	0.195	[0.00]	0.207	[0.00]
SG&A Expenses / Total Assets ($t-1$)					-0.017	[0.49]	-0.006	[0.81]	-0.019	[0.46]	-0.009	[0.71]
R&D/Total Assets ($t-1$)					0.139	[0.07]	0.116	[0.11]	0.115	[0.10]	0.101	[0.12]
PPE (net) / Total Assets ($t-1$)					-0.223	[0.00]	-0.230	[0.00]	-0.221	[0.00]	-0.222	[0.00]
Capital Expenditures/Total Assets ($t-1$)					0.432	[0.00]	0.389	[0.00]	0.416	[0.00]	0.367	[0.00]
Cash and Short-term Investments/Total Assets (log) ($t-1$)					0.232	[0.00]	0.244	[0.00]	0.224	[0.00]	0.220	[0.00]
ROE ($t-1$)					-0.271	[0.00]	-0.283	[0.00]	-0.270	[0.00]	-0.275	[0.00]
Adjusted R ²	0.07		0.16		0.31		0.36		0.33		0.38	
Observations	22,267		22,267		22,267		22,267		22,267		22,267	

(continued)

Table 3: Firm-level Panel Regressions of Idiosyncratic Volatility on Firm Characteristics (continued)

Panel B: Old Firms

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef	<i>p</i> -value										
Number of Firms (<i>t</i> -1)			0.136	[0.00]			0.079	[0.00]			0.089	[0.00]
Market Risk (CRSP VW Index) (log) (<i>t</i> -1)	0.120	[0.15]	0.020	[0.68]					0.044	[0.54]	0.004	[0.94]
Credit Spread (<i>t</i> -1)	-0.108	[0.06]	-0.003	[0.95]					-0.063	[0.23]	-0.014	[0.75]
NBER Recessions (<i>t</i> -1)	-0.028	[0.86]	-0.110	[0.40]					-0.146	[0.33]	-0.165	[0.21]
Chicago Fed Index (<i>t</i> -1)	-0.123	[0.18]	-0.125	[0.09]					-0.155	[0.07]	-0.155	[0.04]
CRSP VW-Return (<i>t</i> -1)	-0.057	[0.81]	-0.048	[0.76]					-0.064	[0.77]	-0.035	[0.85]
Illiquidity Ratio (log) (<i>t</i> -1)					-0.019	[0.14]	-0.046	[0.00]	-0.022	[0.08]	-0.045	[0.00]
Real Market Capitalization (log) (<i>t</i> -1)					-0.161	[0.00]	-0.187	[0.00]	-0.166	[0.00]	-0.187	[0.00]
Firm Age (log) (<i>t</i> -1)					-0.108	[0.00]	-0.094	[0.00]	-0.107	[0.00]	-0.094	[0.00]
Tobin's Q (log) (<i>t</i> -1)					0.179	[0.00]	0.163	[0.00]	0.189	[0.00]	0.174	[0.00]
Leverage (<i>t</i> -1)					0.426	[0.00]	0.417	[0.00]	0.407	[0.00]	0.405	[0.00]
SG&A Expenses / Total Assets (<i>t</i> -1)					-0.006	[0.76]	-0.006	[0.75]	-0.007	[0.71]	-0.007	[0.73]
R&D/Total Assets (<i>t</i> -1)					0.569	[0.00]	0.524	[0.00]	0.522	[0.00]	0.477	[0.00]
PPE (net) / Total Assets (<i>t</i> -1)					-0.083	[0.03]	-0.100	[0.01]	-0.070	[0.07]	-0.086	[0.02]
Capital Expenditures/Total Assets (<i>t</i> -1)					0.453	[0.00]	0.347	[0.00]	0.400	[0.00]	0.293	[0.00]
Cash and Short-term Investments/Total Assets (log) (<i>t</i> -1)					-0.002	[0.97]	0.049	[0.17]	-0.009	[0.84]	0.044	[0.20]
ROE (<i>t</i> -1)					-0.251	[0.00]	-0.257	[0.00]	-0.264	[0.00]	-0.268	[0.00]
Adjusted R ²	0.08		0.15		0.48		0.50		0.49		0.51	
Observations	88,385		88,385		88,385		88,385		88,385		88,385	

(continued)

Table 3: Firm-level Panel Regressions of Idiosyncratic Volatility on Firm Characteristics (continued)

Panel C: All Firms

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef	<i>p</i> -value										
Number of Firms (<i>t</i> -1)			0.167	[0.00]			0.088	[0.00]			0.099	[0.00]
Market Risk (CRSP VW Index) (log) (<i>t</i> -1)	0.154	[0.10]	0.025	[0.59]					0.056	[0.46]	0.006	[0.91]
Credit Spread (<i>t</i> -1)	-0.126	[0.05]	0.017	[0.66]					-0.070	[0.20]	-0.006	[0.91]
NBER Recessions (<i>t</i> -1)	0.000	[1.00]	-0.087	[0.51]					-0.145	[0.35]	-0.161	[0.24]
Chicago Fed Index (<i>t</i> -1)	-0.110	[0.27]	-0.102	[0.15]					-0.152	[0.08]	-0.144	[0.06]
CRSP VW-Return (<i>t</i> -1)	-0.008	[0.98]	-0.027	[0.86]					-0.050	[0.83]	-0.036	[0.85]
Illiquidity Ratio (log) (<i>t</i> -1)					-0.015	[0.21]	-0.043	[0.00]	-0.019	[0.11]	-0.041	[0.00]
Real Market Capitalization (log) (<i>t</i> -1)					-0.151	[0.00]	-0.178	[0.00]	-0.158	[0.00]	-0.178	[0.00]
Firm Age (log) (<i>t</i> -1)					-0.118	[0.00]	-0.096	[0.00]	-0.117	[0.00]	-0.095	[0.00]
Tobin's Q (log) (<i>t</i> -1)					0.142	[0.00]	0.126	[0.00]	0.151	[0.00]	0.137	[0.00]
Leverage (<i>t</i> -1)					0.375	[0.00]	0.370	[0.00]	0.357	[0.00]	0.359	[0.00]
SG&A Expenses / Total Assets (<i>t</i> -1)					-0.001	[0.94]	0.000	[0.98]	-0.005	[0.75]	-0.003	[0.85]
R&D/Total Assets (<i>t</i> -1)					0.430	[0.00]	0.391	[0.00]	0.390	[0.00]	0.353	[0.00]
PPE (net) / Total Assets (<i>t</i> -1)					-0.108	[0.00]	-0.122	[0.00]	-0.099	[0.00]	-0.112	[0.00]
Capital Expenditures/Total Assets (<i>t</i> -1)					0.406	[0.00]	0.309	[0.00]	0.369	[0.00]	0.276	[0.00]
Cash and Short-term Investments/Total Assets (log) (<i>t</i> -1)					0.083	[0.03]	0.122	[0.00]	0.073	[0.04]	0.112	[0.00]
ROE (<i>t</i> -1)					-0.250	[0.00]	-0.256	[0.00]	-0.258	[0.00]	-0.261	[0.00]
Adjusted R ²	0.09		0.19		0.49		0.51		0.50		0.53	
Observations	116,136		116,136		116,136		116,136		116,136		116,136	

Table 4: Industry Panel Regressions

The table shows results from panel regressions of average idiosyncratic volatility (IV) on alternative listing variables at the industry level (48 Fama French industries). Panel A regresses the percentage change in the centered, 5-year moving average of alternatively equal- and value weighted IV on the percentage change in the number of listed firms for lags of 1 to 5 years. Results are shown separately for all firms and old firms (firm age greater than 5 years). IV is estimated using the market model for each calendar year using daily returns. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. Panel B shows second-stage results of industry panel regressions with instrumented variables. It regresses the percentage change in the centered, 5-year moving average of alternatively equal- and value weighted IV on the percentage change in the number of listed firms over 5 or 3 years, lagged by one and three years respectively. Regressions include macro-economic variables and industry fixed effects as indicated in the table. The instrument is the weighted average of number of firms in the corresponding 12 Fama French Industries, excluding the focal industry, which is included with a lag. The panel reports underidentification (Kleibergen–Paap rk LM), weak instruments (Kleibergen–Paap rk Wald F), and overidentification (Hansen J) test statistics and corresponding p -values. First stage results are reported in the Internet Appendix. The table reports regression coefficients and associated p -values, the (adjusted) regression R-Squared, and the number of observations. Panel A also reports the sum of the coefficients of the listing variables and a test of it being equal to zero. IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The number of firms in an industry is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. The sample period is 1978 to 2020.

(continued)

Table 4: Industry Panel Regressions (continued)

Panel A: Moving Averages

	Percentage Change in 5-year Central Moving Average of IV (t)							
	Equal-weighted Idiosyncratic				Value-weighted Idiosyncratic			
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
All Firms								
Percent Change Number of Firms ($t-1$)	0.045	[0.20]			0.019	[0.54]		
Percent Change Number of Firms ($t-2$)	0.073	[0.08]			0.070	[0.06]		
Percent Change Number of Firms ($t-3$)	0.080	[0.00]	0.091	[0.00]	0.063	[0.05]	0.072	[0.03]
Percent Change Number of Firms ($t-4$)	0.054	[0.05]	0.063	[0.06]	0.040	[0.09]	0.046	[0.08]
Percent Change Number of Firms ($t-5$)	0.026	[0.23]	0.033	[0.13]	0.028	[0.30]	0.033	[0.21]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.034	[0.23]	-0.035	[0.20]	-0.039	[0.19]	-0.040	[0.18]
Credit Spread ($t-1$)	-0.031	[0.02]	-0.034	[0.01]	-0.047	[0.00]	-0.049	[0.00]
NBER Recessions ($t-1$)	0.064	[0.18]	0.067	[0.21]	0.061	[0.29]	0.062	[0.32]
Chicago Fed Index ($t-1$)	-0.018	[0.37]	-0.017	[0.41]	-0.037	[0.04]	-0.037	[0.05]
CRSP VW-Return ($t-1$)	0.018	[0.77]	0.012	[0.85]	0.035	[0.65]	0.030	[0.70]
Sum Coef Listing Variables	0.279		0.186		0.219		0.151	
p -value (Test Sum of Coefficients)	[0.01]		[0.00]		[0.02]		[0.03]	
R ²	0.24		0.23		0.26		0.25	
Observations	1,554		1,554		1,554		1,554	
Old Firms								
Percent Change Number of Firms ($t-1$)	0.006	[0.87]			-0.002	[0.94]		
Percent Change Number of Firms ($t-2$)	0.061	[0.10]			0.056	[0.12]		
Percent Change Number of Firms ($t-3$)	0.087	[0.00]	0.095	[0.00]	0.067	[0.04]	0.074	[0.03]
Percent Change Number of Firms ($t-4$)	0.088	[0.00]	0.092	[0.00]	0.054	[0.03]	0.057	[0.03]
Percent Change Number of Firms ($t-5$)	0.057	[0.01]	0.061	[0.01]	0.043	[0.11]	0.046	[0.09]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.029	[0.31]	-0.029	[0.29]	-0.039	[0.19]	-0.039	[0.19]
Credit Spread ($t-1$)	-0.031	[0.02]	-0.033	[0.01]	-0.046	[0.00]	-0.047	[0.00]
NBER Recessions ($t-1$)	0.060	[0.17]	0.060	[0.20]	0.057	[0.32]	0.057	[0.34]
Chicago Fed Index ($t-1$)	-0.019	[0.33]	-0.019	[0.33]	-0.037	[0.04]	-0.038	[0.05]
CRSP VW-Return ($t-1$)	0.019	[0.76]	0.015	[0.82]	0.042	[0.59]	0.038	[0.63]
Sum Coef Listing Variables	0.300		0.248		0.218		0.178	
p -value (Test Sum of Coefficients)	[0.01]		[0.00]		[0.03]		[0.01]	
R ²	0.24		0.23		0.25		0.25	
Observations	1,554		1,554		1,554		1,554	

(continued)

Table 4: Industry Panel Regressions (continued)

Panel B: Instrumental Variables Regressions

	Percentage Change in 5-year Central Moving Average of IV (t)							
	Equal-weighted Idiosyncratic Volatility				Value-weighted Idiosyncratic Volatility			
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Regressions with Macroeconomic Controls and Industry Fixed Effects								
Percent Change Number of Firms ($t-1$) (past 5 years)	0.130	[0.01]			0.126	[0.09]		
Percent Change Number of Firms ($t-3$) (past 3 years)			0.287	[0.00]			0.288	[0.06]
R ²	0.12		-0.05		0.12		0.00	
Observations	1,478		1,478		1,478		1,478	
Underidentification (Kleibergen–Paap rk LM)	5.31		6.15		5.31		6.15	
<i>p</i> -value	[0.07]		[0.05]		[0.07]		[0.05]	
Weak instruments (Kleibergen–Paap rk Wald F)	15.8		15.7		15.8		15.7	
Overidentification (Hansen J)	0.01		0.59		0.00		0.63	
<i>p</i> -value	[0.94]		[0.44]		[0.99]		[0.43]	
Regressions with Industry Fixed Effects								
Percent Change Number of Firms ($t-1$) (past 5 years)	0.144	[0.01]			0.145	[0.08]		
Percent Change Number of Firms ($t-3$) (past 3 years)			0.197	[0.07]			0.189	[0.23]
R ²	-0.05		-0.09		-0.08		-0.07	
Observations	1,478		1,478		1,478		1,478	
Underidentification (Kleibergen–Paap rk LM)	5.35		6.56		5.35		6.56	
<i>p</i> -value	[0.07]		[0.04]		[0.07]		[0.04]	
Weak instruments (Kleibergen–Paap rk Wald F)	14.8		21.3		14.8		21.3	
Overidentification (Hansen J)	1.78		1.99		2.40		2.57	
<i>p</i> -value	[0.18]		[0.16]		[0.12]		[0.11]	

Table 5: Industry Panel Regressions with IV and Creative Destruction Proxies

The table shows results from panel regressions of annual idiosyncratic volatility (IV) on alternative proxies for creative destruction at the industry level (48 Fama French industries). In particular, the dependent variable is the equal- and value weighted average of IV, while the independent variables are the cross-sectional standard deviations of alternatively operating income/total assets or investment/total assets. Investment is the sum of capital expenditure and R&D expenses. The independent variables are either contemporaneous or lagged by one year. Proxies for creative destruction are based on accounting data of all firms in Compustat and assigned to the calendar with its most overlap. The regressions include industry and year fixed effects. Standard errors are clustered by industry and year. The table reports regression coefficients and associated *p*-values, the (adjusted) regression R-Squared, and the number of observations. IV is estimated using the market model for each calendar year using daily returns. It is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

	Equal-weighted IV				Value-weighted IV			
	(1)		(2)		(1)		(2)	
	Coef	<i>p</i> -value	Coef	<i>p</i> -value	Coef	<i>p</i> -value	Coef	<i>p</i> -value
Standard Deviation of Operating Income/Total Assets	0.285	[0.00]			0.093	[0.03]		
Standard Deviation of Investment/Total Assets			0.372	[0.02]			0.148	[0.09]
Adjusted R ²	0.77		0.76		0.74		0.73	
Observations	1,806		1,806		1,806		1,806	
Standard Deviation of Operating Income/Total Assets (t-1)	0.245	[0.00]			0.096	[0.04]		
Standard Deviation of Investment/Total Assets (t-1)			0.387	[0.01]			0.140	[0.09]
Adjusted R ²	0.77		0.76		0.74		0.74	
Observations	1,764		1,764		1,764		1,764	

Table 6: Industry Panel Regressions of Proxies for Creative Destruction on Listing Variables

The table shows results from panel regressions of annual proxies for creative destruction on alternative listing variables at the industry level (48 Fama French industries). Proxies for creative destruction are the cross-sectional standard deviation of operating income/total assets and investment/total assets within an industry, alternatively based on all firms or old firms (firm age greater than 5 years). Investment is the sum of capital expenditure and R&D expenses. Proxies for creative destruction are based on accounting data of all firms in Compustat and assigned to the calendar with its most overlap. Proxies of creative destruction in year t are regressed on the percentage change in the number of listed firms lagged by 1 to 5 years or over prior 5 years. The number of firms in an industry is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. The table reports regression coefficients and associated p -values, the (adjusted) regression R-Squared, and the number of observations. It also reports the sum of the coefficients of the listing variables, and a test of it being equal to zero. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

	All Firms				Old Firms			
	Percentage Change (t) (past 5 years)							
	Standard Deviation of Operating Income/Total Assets		Standard Deviation of Investment/Total Assets		Standard Deviation of Operating Income/Total Assets		Standard Deviation of Investment/Total Assets	
	Coef	p -value	Coef	p -value	Coef	p -value	Coef	p -value
Percent Change Number of Firms ($t-1$)	0.451	[0.01]	0.544	[0.00]	0.439	[0.02]	0.335	[0.01]
Percent Change Number of Firms ($t-2$)	0.139	[0.34]	0.200	[0.04]	0.111	[0.46]	0.206	[0.02]
Percent Change Number of Firms ($t-3$)	0.209	[0.41]	0.153	[0.15]	0.254	[0.05]	0.232	[0.06]
Percent Change Number of Firms ($t-4$)	0.056	[0.80]	0.156	[0.39]	0.370	[0.05]	0.270	[0.03]
Percent Change Number of Firms ($t-5$)	0.154	[0.36]	0.104	[0.46]	0.214	[0.16]	0.212	[0.04]
Sum Coef Listing Variables	1.010		1.158		1.388		1.256	
p -value (Test Sum of Coefficients)	[0.06]		[0.00]		[0.00]		[0.00]	
Adjusted R ²	0.07		0.07		0.06		0.06	
Observations	1,554		1,554		1,554		1,554	
Percentage Change Number of Firms ($t-1$) (past 5 years)	0.174	[0.06]	0.215	[0.00]	0.267	[0.00]	0.246	[0.00]
R ²	0.06		0.07		0.06		0.06	
Observations	1,554		1,554		1,554		1,554	

Table 7: Industry Panel Regressions with Delists and Lagged New Lists

The table shows results from panel regressions of monthly delisting rates on lagged new listing rates at the industry level (48 Fama French industries). In particular, delists in year t scaled by the number of firms at the end of year $t-1$ is regressed on listing rates defined as new listing in year $t-1$ scaled by the number for firms at the end of year $t-2$. Listing rates are included alternatively lagged by 1 to 5 years or over prior 5 years. Delisting rates are alternatively based on all firms or old firms (firm age greater than 5 years). The number of new lists and the number of firms at the end of the prior calendar year is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3). Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. Standard errors are clustered by industry and year. The table reports regression coefficients and associated p -values, the (adjusted) regression R-Squared, and the number of observations. It also reports the sum of the coefficients of the listing variables and a test of it being equal to zero. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

	Delists (t)		Delists of Old Firms (t)	
	Coef	p -value	Coef	p -value
New Lists ($t-1$)	-0.034	[0.47]	0.005	[0.93]
New Lists ($t-2$)	0.038	[0.18]	0.028	[0.63]
New Lists ($t-3$)	0.052	[0.20]	0.007	[0.80]
New Lists ($t-4$)	0.006	[0.86]	-0.056	[0.01]
New Lists ($t-5$)	0.100	[0.01]	0.137	[0.00]
Sum Coefs Listings Variables	0.161		0.121	
p -value (Test Sum Coefs Listing Variables)	[0.00]		[0.03]	
R ²	0.16		0.15	
Observations	1,554		1,554	
<hr/>				
New Lists ($t-1$) (past 5 years)	0.024	[0.00]	0.014	[0.09]
R ²	0.15		0.13	
Observations	1,554		1,554	

Table 8: Turnover and Number of Listed Firms

The table shows results from panel regressions with turnover and the number of listed firms at the industry level (48 Fama French industries). In particular, we identify the top 3 (or alternatively top 5) firms in an industry in year t and determine the fraction of these firms that are still in the top after three (or alternatively after five) years. We regress these fractions of firms on percentage changes in the number of listed firms lagged by 1 to 5 years. The number of listed firms is based on the number of common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. The table reports regression coefficients and associated p -values, the regression R-Squared, and the number of observations. It also reports the sum of the coefficients of the listing variables, and a test of it being equal to zero. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

	Top 3 Firms by Sales				Top 5 Firms by Sales			
	Fraction Existing in Year		Fraction Existing in Year		Fraction Existing in Year		Fraction Existing in Year	
	t+3		t+5		t+3		t+5	
	Coef	p -value						
All Industry-Year Observations								
Percent Change Number of Firms ($t-1$)	-0.016	[0.65]	0.001	[0.97]	-0.004	[0.89]	-0.019	[0.65]
Percent Change Number of Firms ($t-2$)	-0.027	[0.49]	-0.075	[0.14]	-0.047	[0.14]	-0.011	[0.76]
Percent Change Number of Firms ($t-3$)	0.094	[0.03]	0.005	[0.92]	-0.005	[0.90]	-0.032	[0.36]
Percent Change Number of Firms ($t-4$)	-0.069	[0.10]	-0.093	[0.05]	-0.038	[0.32]	-0.068	[0.01]
Percent Change Number of Firms ($t-5$)	-0.069	[0.14]	-0.114	[0.03]	-0.047	[0.19]	-0.098	[0.01]
Sum Coefs Listings Variables	-0.086		-0.275		-0.141		-0.228	
p -value (Test Sum Coefs Listing Variables)	[0.13]		[0.03]		[0.10]		[0.01]	
R ²	0.17		0.22		0.16		0.22	
Observations	1,344		1,344		1,344		1,344	
At least 20 Firms per Industry-Year Observation								
Percent Change Number of Firms ($t-1$)	-0.109	[0.03]	-0.028	[0.60]	-0.029	[0.49]	-0.069	[0.11]
Percent Change Number of Firms ($t-2$)	0.083	[0.10]	-0.023	[0.66]	-0.062	[0.21]	-0.025	[0.58]
Percent Change Number of Firms ($t-3$)	0.062	[0.32]	-0.043	[0.66]	-0.053	[0.40]	-0.075	[0.13]
Percent Change Number of Firms ($t-4$)	-0.063	[0.26]	-0.143	[0.04]	-0.038	[0.35]	-0.057	[0.13]
Percent Change Number of Firms ($t-5$)	-0.192	[0.00]	-0.204	[0.01]	-0.041	[0.39]	-0.086	[0.17]
Sum Coefs Listings Variables	-0.220		-0.441		-0.223		-0.313	
p -value (Test Sum Coefs Listing Variables)	[0.00]		[0.00]		[0.01]		[0.00]	
R ²	0.21		0.27		0.20		0.27	
Observations	1,060		1,060		1,060		1,060	

Table 9: Firm-level Panel Regressions of Idiosyncratic Volatility on Innovation

The table shows results from panel regressions of the natural logarithm of annual firm-level idiosyncratic volatility (IV) on the lagged measures of innovation and creative destruction, lagged macro-economic variables, and lagged firm characteristics. Results are reported separately for young firms (age less than or equal to 5 years), old firms (age greater than 5 years), and all firms. IV is estimated using the market model for each calendar year using daily data. Regressions include the same macro-economic variables and firm characteristics as Table 3, but they are not reported for brevity. The regressions also include firm fixed effects. Standard errors are clustered by firm and year. The table reports regression coefficients and associated p -values, the adjusted regression R-Squared, and the number of observations. The sample consists of all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The number of firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3). The sample period is 1978 to 2020.

	Young Firms				Old Firms				All Firms			
	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef	p -value	Coef	p -value	Coef	p -value	Coef	p -value	Coef	p -value	Coef	p -value
Nominal Patent Value/Total Assets Others (t-1)	0.272	[0.00]			0.372	[0.00]			0.412	[0.00]		
R&D/Total Assets Others (t-1)			0.008	[0.15]			0.011	[0.01]			0.013	[0.00]
Nominal Patent Value/Total Assets (t-1)	-0.019	[0.11]			0.061	[0.00]			0.045	[0.00]		
R&D/Total Assets (t-1)	-0.069	[0.33]	-0.066	[0.39]	0.017	[0.78]	0.057	[0.41]	0.029	[0.57]	0.078	[0.21]
Adjusted R ²	0.73		0.73		0.67		0.66		0.68		0.67	
Observations	20,514		20,514		87,423		87,423		114,541		114,541	

Table 10: Industry Panel Regressions with Innovation and Listings

The table shows results from panel regressions with turnover and the number of listed firms at the industry level (48 Fama French industries). In particular, we identify the top 3 (or alternatively top 5) firms in an industry in year t and determine the fraction of these firms that are still in the top after three (or alternatively after five) years. We regress these fractions of firms on percentage changes in the number of listed firms lagged by 1 to 5 years. The number of listed firms is based on the number of common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. The table reports regression coefficients and associated p -values, the regression R-Squared, and the number of observations. It also reports the sum of the coefficients of the listing variables, and a test of it being equal to zero. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

	Innovation of All Firms (t to $t+2$)							
	Nominal		Citation		Citation-weighted			
	Patents/Total		Share/Total		Patents/Total		R&D/Total	
	Assets		Assets		Assets		Assets	
	Coef	p -value	Coef	p -value	Coef	p -value	Coef	p -value
All Industry-Year Observations								
Percent Change Number of Firms ($t-1$)	-0.026	[0.35]	0.002	[0.01]	0.000	[0.91]	0.002	[0.12]
Percent Change Number of Firms ($t-2$)	-0.013	[0.64]	0.001	[0.05]	-0.002	[0.55]	0.001	[0.32]
Percent Change Number of Firms ($t-3$)	0.018	[0.51]	0.001	[0.02]	-0.003	[0.17]	0.002	[0.04]
Percent Change Number of Firms ($t-4$)	0.011	[0.70]	0.001	[0.06]	-0.004	[0.13]	0.002	[0.06]
Percent Change Number of Firms ($t-5$)	-0.001	[0.97]	0.001	[0.01]	-0.004	[0.21]	0.003	[0.08]
Sum Coefs Listings Variables	-0.011		0.006		-0.012		0.011	
p -value (Test Sum Coefs Listing Variables)	[0.92]		[0.00]		[0.24]		[0.06]	
R ²	0.52		0.61		0.73		0.93	
Observations	1,554		1,554		1,554		1,554	
At least 20 Firms per Industry-Year Observation								
Percent Change Number of Firms ($t-1$)	-0.072	[0.11]	0.003	[0.00]	0.002	[0.75]	0.001	[0.29]
Percent Change Number of Firms ($t-2$)	-0.035	[0.38]	0.001	[0.04]	-0.001	[0.73]	0.001	[0.64]
Percent Change Number of Firms ($t-3$)	0.026	[0.61]	0.002	[0.02]	-0.005	[0.24]	0.004	[0.03]
Percent Change Number of Firms ($t-4$)	0.024	[0.56]	0.001	[0.07]	-0.004	[0.34]	0.003	[0.06]
Percent Change Number of Firms ($t-5$)	-0.004	[0.94]	0.002	[0.01]	-0.005	[0.33]	0.003	[0.10]
Sum Coefs Listings Variables	-0.061		0.009		-0.013		0.012	
p -value (Test Sum Coefs Listing Variables)	[0.68]		[0.00]		[0.37]		[0.07]	
R ²	0.52		0.72		0.73		0.94	
Observations	1,205		1,205		1,205		1,205	

Table 11: Industry Panel Regressions of Turnover on Innovation

The table shows results from panel regressions with turnover and innovation measures at the industry level (48 Fama French industries). In particular, we identify the top 3 (or alternatively top 5) firms in an industry in year t and determine the fraction of these firms that are still in the top after three (or alternatively after five) years. We regress these fractions of firms on lagged measures of innovation, i.e., nominal patent values/total assets and R&D/total assets. Innovation measures are alternatively based on all firms, young firms, or old firms in an industry. Panel A shows results for all industry-year observations, while Panel B requires at least 20 firms in an industry-year. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. Standard errors are clustered by industry and year. The table reports regression coefficients and associated p -values, the regression R-Squared, and the number of observations. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

	Panel A: All Industry-Years							
	Top 3 Firms by Sales				Top 5 Firms by Sales			
	Fraction Existing in Year		Fraction Existing in Year		Fraction Existing in Year		Fraction Existing in Year	
	t+3		t+5		t+3		t+5	
	Coef	p -value	Coef	p -value	Coef	p -value	Coef	p -value
Nominal Patent Value/Total Assets (t-1)	-0.040	[0.60]	0.010	[0.91]	-0.022	[0.65]	0.043	[0.36]
R ²	0.15		0.19		0.13		0.17	
Observations	1,554		1,554		1,554		1,554	
R&D/Total Assets (t-1)	-1.839	[0.10]	-1.397	[0.32]	-2.649	[0.00]	-2.214	[0.00]
R ²	0.15		0.19		0.14		0.17	
Observations	1,554		1,554		1,554		1,554	
Nominal Patent Value/Total Assets (t-1) (Young Firms)	-0.014	[0.00]	-0.027	[0.00]	-0.015	[0.00]	-0.018	[0.00]
R ²	0.16		0.21		0.14		0.18	
Observations	1,488		1,488		1,488		1,488	
R&D/Total Assets (t-1) (Young Firms)	-0.865	[0.10]	-0.651	[0.31]	-0.680	[0.05]	-0.185	[0.69]
R ²	0.16		0.21		0.14		0.18	
Observations	1,503		1,503		1,503		1,503	
Nominal Patent Value/Total Assets (t-1) (Old Firms)	-0.014	[0.82]	0.037	[0.61]	-0.002	[0.96]	0.052	[0.25]
R ²	0.15		0.19		0.13		0.17	
Observations	1,554		1,554		1,554		1,554	
R&D/Total Assets (t-1) (Old Firms)	-1.433	[0.20]	-0.982	[0.51]	-2.104	[0.00]	-1.830	[0.01]
R ²	0.15		0.19		0.14		0.17	
Observations	1,554		1,554		1,554		1,554	

(continued)

Table 11: Industry Panel Regressions of Turnover on Innovation (continued)

Panel B: Industry-Years with at least 20 Firms

	Top 3 Firms by Sales				Top 5 Firms by Sales			
	Fraction Existing in Year		Fraction Existing in Year		Fraction Existing in Year		Fraction Existing in Year	
	t+3		t+5		t+3		t+5	
	Coef	<i>p</i> -value						
Nominal Patent Value/Total Assets (t-1)	-0.061	[0.41]	-0.015	[0.87]	-0.034	[0.52]	0.024	[0.61]
R ²	0.18		0.21		0.16		0.21	
Observations	1,247		1,247		1,247		1,247	
R&D/Total Assets (t-1)	-2.322	[0.02]	-1.358	[0.37]	-2.788	[0.00]	-1.915	[0.04]
R ²	0.18		0.22		0.17		0.21	
Observations	1,247		1,247		1,247		1,247	
Nominal Patent Value/Total Assets (t-1) (Young Firms)	-0.015	[0.00]	-0.028	[0.00]	-0.012	[0.00]	-0.016	[0.00]
R ²	0.18		0.22		0.16		0.21	
Observations	1,243		1,243		1,243		1,243	
R&D/Total Assets (t-1) (Young Firms)	-1.259	[0.00]	-0.690	[0.33]	-0.768	[0.04]	-0.231	[0.64]
R ²	0.18		0.21		0.16		0.21	
Observations	1,245		1,245		1,245		1,245	
Nominal Patent Value/Total Assets (t-1) (Old Firms)	-0.036	[0.55]	0.002	[0.98]	-0.017	[0.71]	0.028	[0.55]
R ²	0.18		0.21		0.16		0.21	
Observations	1,247		1,247		1,247		1,247	
R&D/Total Assets (t-1) (Old Firms)	-1.818	[0.09]	-1.152	[0.47]	-2.178	[0.00]	-1.545	[0.08]
R ²	0.18		0.22		0.16		0.21	
Observations	1,247		1,247		1,247		1,247	

Table 12: Regressions with Census Firms

The table shows results from regressions with average idiosyncratic volatility (IV) and the number of listed and Census firms. Panel A estimates time-series regressions. In particular, annual levels and percentage changes in centralized, 5-year moving equal- and value weighted IV are regressed on levels and percentage changes in the number of listed firms and the number of Census firms lagged by 3 years. IV is estimated using the market model for each calendar year using daily data. It is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The number of listed firms is based on the number of common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. The number of Census firms applies alternatively a threshold of 20 and 100 employees. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. The panel reports regression coefficients and associated *p*-values, the regression adjusted R-Squared, and the number of observations. Standard errors based on Newey-West (1987) with 5 lags. Panel B estimates panel regressions at the industry level (48 Fama French industries). In particular, it regresses percentage changes in the centered, 5-year moving average of equal-weighted IV on percentage changes in the number of listed and Census firms for lags of 1 to 5 years. IV is estimated using the market model for each calendar year using daily data. It is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The number of listed firms is based on the number of common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. The number of Census firms applies alternatively a threshold of 20 and 100 employees. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. The panel reports regression coefficients and associated *p*-values, the adjusted regression R-Squared, and the number of observations. Separately for listed firms and Census firms, it reports the sum of the coefficients of the listing variables and a test of it being equal to zero. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

Panel A: Time-series Regressions

	5-year Central Moving Average																			
	Equal-weighted Idiosyncratic Volatility					Value-weighted Idiosyncratic Volatility														
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)										
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value										
Average Idiosyncratic Volatility (ϵ)																				
Number of Listed Firms ($t-3$)	0.068	[0.00]			0.070	[0.00]	0.071	[0.00]			0.035	[0.00]			0.037	[0.00]	0.037	[0.00]		
Number of Census Firms > 20 ($t-3$)			0.043	[0.88]			0.221	[0.06]					0.022	[0.86]			0.115	[0.29]		
Number of Census Firms > 100 ($t-3$)					0.139	[0.90]			0.887	[0.03]					0.005	[0.99]			0.393	[0.34]
Intercept	0.230	[0.05]	0.868	[0.00]	0.871	[0.00]	0.095	[0.44]	0.089	[0.45]	0.130	[0.03]	0.463	[0.00]	0.473	[0.00]	0.060	[0.59]	0.067	[0.54]
Adjusted R ²	0.77		0.11		0.11		0.80		0.80		0.61		0.07		0.07		0.62		0.62	
Observations	40		40		40		40		40		40		40		40		40		40	
Percentage Change in Average Idiosyncratic Volatility (ϵ)																				
Percent Change Number of Listed Firms ($t-3$)	0.582	[0.01]			0.544	[0.01]	0.541	[0.01]	0.587	[0.03]					0.578	[0.05]	0.593	[0.05]		
Percent Change Number of Census Firms > 20 ($t-3$)			0.818	[0.05]			0.573	[0.18]					0.392	[0.29]			0.131	[0.77]		
Percent Change Number of Census Firms > 100 ($t-3$)					0.938	[0.07]			0.643	[0.19]					0.219	[0.74]			-0.104	[0.87]
Intercept	0.032	[0.66]	-0.042	[0.61]	-0.048	[0.55]	-0.010	[0.89]	-0.013	[0.84]	0.091	[0.32]	0.047	[0.67]	0.060	[0.63]	0.081	[0.39]	0.098	[0.36]
Adjusted R ²	0.23		0.10		0.10		0.24		0.24		0.25		0.14		0.13		0.22		0.22	
Observations	39		39		39		39		39		39		39		39		39		39	

(continued)

Table 12: Regressions with Census Firms (continued)

Panel B: Industry Panel Regressions

	Percentage Change in IV in 5-year Central Moving Average (<i>t</i>)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Equal-weighted Idiosyncratic Volatility										
Percentage Change Number of Listed Firms (<i>t</i> -1)	0.041	[0.28]					0.039	[0.31]	0.039	[0.30]
Percentage Change Number of Listed Firms (<i>t</i> -2)	0.086	[0.05]					0.075	[0.09]	0.080	[0.07]
Percentage Change Number of Listed Firms (<i>t</i> -3)	0.073	[0.01]	0.089	[0.00]			0.052	[0.03]	0.056	[0.02]
Percentage Change Number of Listed Firms (<i>t</i> -4)	0.053	[0.03]	0.063	[0.04]			0.038	[0.14]	0.037	[0.13]
Percentage Change Number of Listed Firms (<i>t</i> -5)	0.025	[0.28]	0.031	[0.17]			0.012	[0.57]	0.008	[0.72]
Percentage Change Number of Census Firms > 20 (<i>t</i> -1)			0.235	[0.00]			0.171	[0.07]		
Percentage Change Number of Census Firms > 20 (<i>t</i> -2)			0.190	[0.02]			0.154	[0.03]		
Percentage Change Number of Census Firms > 20 (<i>t</i> -3)			0.071	[0.13]	0.152	[0.01]	0.040	[0.46]	0.097	[0.12]
Percentage Change Number of Census Firms > 20 (<i>t</i> -4)			0.019	[0.86]	0.046	[0.68]	0.013	[0.91]	0.025	[0.83]
Percentage Change Number of Census Firms > 20 (<i>t</i> -5)			0.038	[0.50]	0.039	[0.47]	0.026	[0.66]	0.024	[0.67]
Percentage Change Number of Census Firms > 100 (<i>t</i> -1)					0.217	[0.00]			0.169	[0.00]
Percentage Change Number of Census Firms > 100 (<i>t</i> -2)					0.139	[0.04]			0.104	[0.12]
Percentage Change Number of Census Firms > 100 (<i>t</i> -3)					0.115	[0.01]	0.144	[0.01]	0.093	[0.06]
Percentage Change Number of Census Firms > 100 (<i>t</i> -4)					0.024	[0.75]	0.009	[0.90]	0.014	[0.87]
Percentage Change Number of Census Firms > 100 (<i>t</i> -5)					0.053	[0.24]	0.049	[0.25]	0.040	[0.43]
Sum Coef Listing Variables Listed	0.279		0.182				0.217		0.219	
Sum Coef Listing Variables Census			0.554		0.237		0.549		0.420	
<i>p</i> -value (Test Sum of Coefficients Listed)	[0.01]		[0.01]				[0.08]		[0.07]	
<i>p</i> -value (Test Sum of Coefficients Census)			[0.00]		[0.06]		[0.00]		[0.05]	
Adjusted R ²	0.09		0.05		0.01		0.04		0.11	
Observations	1,443		1,443		1,443		1,443		1,443	
Value-weighted Idiosyncratic Volatility										
Percentage Change Number of Listed Firms (<i>t</i> -1)	0.012	[0.74]					0.012	[0.74]	0.012	[0.75]
Percentage Change Number of Listed Firms (<i>t</i> -2)	0.077	[0.06]					0.063	[0.11]	0.071	[0.07]
Percentage Change Number of Listed Firms (<i>t</i> -3)	0.056	[0.08]	0.068	[0.05]			0.038	[0.19]	0.041	[0.16]
Percentage Change Number of Listed Firms (<i>t</i> -4)	0.032	[0.13]	0.039	[0.11]			0.023	[0.37]	0.020	[0.40]
Percentage Change Number of Listed Firms (<i>t</i> -5)	0.022	[0.46]	0.026	[0.35]			0.013	[0.65]	0.010	[0.72]
Percentage Change Number of Census Firms > 20 (<i>t</i> -1)			0.240	[0.04]			0.191	[0.11]		
Percentage Change Number of Census Firms > 20 (<i>t</i> -2)			0.138	[0.10]			0.113	[0.14]		
Percentage Change Number of Census Firms > 20 (<i>t</i> -3)			0.034	[0.60]	0.100	[0.09]	0.014	[0.85]	0.060	[0.41]
Percentage Change Number of Census Firms > 20 (<i>t</i> -4)			0.036	[0.75]	0.063	[0.58]	0.029	[0.80]	0.045	[0.70]
Percentage Change Number of Census Firms > 20 (<i>t</i> -5)			-0.052	[0.46]	-0.056	[0.41]	-0.057	[0.44]	-0.066	[0.36]
Percentage Change Number of Census Firms > 100 (<i>t</i> -1)					0.204	[0.01]			0.167	[0.02]
Percentage Change Number of Census Firms > 100 (<i>t</i> -2)					0.093	[0.14]			0.068	[0.29]
Percentage Change Number of Census Firms > 100 (<i>t</i> -3)					0.072	[0.11]	0.094	[0.08]	0.056	[0.27]
Percentage Change Number of Census Firms > 100 (<i>t</i> -4)					0.030	[0.72]	0.014	[0.86]	0.023	[0.79]
Percentage Change Number of Census Firms > 100 (<i>t</i> -5)					-0.016	[0.76]	-0.018	[0.73]	-0.024	[0.70]
Sum Coef Listing Variables Listed	0.198		0.133				0.149		0.154	
Sum Coef Listing Variables Census			0.397		0.107		0.383		0.291	
<i>p</i> -value (Test Sum of Coefficients Listed)	[0.04]		[0.04]				[0.18]		[0.15]	
<i>p</i> -value (Test Sum of Coefficients Census)			[0.03]		[0.45]		[0.05]		[0.20]	
Adjusted R ²	0.04		0.02		0.01		0.03		0.06	
Observations	1,443		1,443		1,443		1,443		1,443	

Table 13: Industry Panel Regressions of Proxies for Creative Destruction on Listing Variables

The table shows results from panel regressions of annual proxies for creative destruction on the number of listed and Census firms at the industry level (48 Fama French industries). Proxies for creative destruction are the cross-sectional standard deviation of operating income/total assets and investment/total assets within an industry. Investment is the sum of capital expenditure and R&D expenses. Proxies for creative destruction are based on accounting data of all firms in Compustat and assigned to the calendar year with its most overlap. Percentage changes in proxies of creative destruction from year $t-5$ to year t are regressed on percentage changes in the number of listed and Census firms in an industry lagged by 1 to 5 years. The number of listed firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. The number of Census firms uses a threshold of alternatively 20 and 100 employees. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. The table reports regression coefficients and associated p -values, the (adjusted) regression R-Squared, and the number of observations. Separately for listed firms and Census firms, it reports the sum of the coefficients of the listing variables, and a test of it being equal to zero. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

	Census Firms ≥ 20				Census Firms ≥ 100			
	Percentage Change (t) (past 5 years)							
	Standard Deviation of Operating Income/Total Assets		Standard Deviation of Investment/Total Assets		Standard Deviation of Operating Income/Total Assets		Standard Deviation of Investment/Total Assets	
	Coef	p -value	Coef	p -value	Coef	p -value	Coef	p -value
Percent Change Number of Listed Firms (t-1)	0.563	[0.00]	0.614	[0.00]	0.556	[0.00]	0.610	[0.00]
Percent Change Number of Listed Firms (t-2)	0.252	[0.09]	0.308	[0.00]	0.249	[0.08]	0.307	[0.00]
Percent Change Number of Listed Firms (t-3)	0.157	[0.59]	0.172	[0.10]	0.186	[0.52]	0.169	[0.11]
Percent Change Number of Listed Firms (t-4)	-0.035	[0.89]	0.296	[0.15]	-0.008	[0.98]	0.281	[0.16]
Percent Change Number of Listed Firms (t-5)	0.277	[0.14]	0.247	[0.04]	0.257	[0.15]	0.195	[0.09]
Percent Change Number of Census Firms (t-1)	-0.418	[0.51]	-0.358	[0.35]	0.164	[0.65]	-0.045	[0.90]
Percent Change Number of Census Firms (t-2)	1.208	[0.00]	0.564	[0.07]	0.337	[0.40]	0.110	[0.65]
Percent Change Number of Census Firms (t-3)	0.537	[0.17]	-0.025	[0.91]	0.277	[0.40]	-0.184	[0.26]
Percent Change Number of Census Firms (t-4)	0.070	[0.84]	-0.638	[0.04]	0.204	[0.57]	-0.261	[0.30]
Percent Change Number of Census Firms (t-5)	-0.980	[0.04]	-1.121	[0.00]	-0.194	[0.46]	-0.332	[0.04]
Sum Coef Listing Variables Listed	1.215		1.638		1.239		1.562	
Sum Coef Listing Variables Census	0.416		-1.578		0.788		-0.713	
p -value (Test Sum of Coefficients Listed)	[0.03]		[0.00]		[0.02]		[0.00]	
p -value (Test Sum of Coefficients Census)	[0.65]		[0.00]		[0.32]		[0.19]	
Adjusted R ²	0.09		0.11		0.08		0.10	
Observations	1,443		1,443		1,443		1,443	

Appendix A: Variable Definitions

The table shows the variables used in the paper and their definitions.

Variable	Definition
Panel A: Listing Variables	
Delists /Listings	Number delisted firms/Number of listed firms (end of prior period)
Gross New Lists/Listings	(Number of newly listed firms + Number of delisted firms)/Number of listed firms (end of prior period)
Net New Lists/Listings	(Number of newly listed firms - Number of delisted firms)/Number of listed firms (end of prior period)
New Lists /Listings	Number of new lists/ Number of listed firms (end of prior period)
Number of Firms	For listed firms, this is the number of common stocks (share code 10 and 11) on NYSE, AMEX, and Nasdaq (exchange code 1, 2, and 3) as of the end of the calendar month or year. For Census firms, this is the number for firms with at least 20 and 100 employees, respectively.
Panel B: Macroeconomic variables	
Chicago Fed Index	Chicago Fed National Activity Index: Total (CFNAITot). We use a regression analysis to construct values of CFNAITot prior to March 1967 using available subcomponents.
Credit Spread	Difference between Moody's seasoned Baa corporate bond yield provided by Board of Governors of the Federal Reserve System, averages of business days (H.15 release) (BAA) and Constant maturity 10-year U.S. Treasury yield provided by Board of Governors of the Federal Reserve System, averages of business days (H.15 release) (GS10)
CRSP VW-Return	Return on CRSP value-weighted stock market index (incl. dividends)
Dispersion Real Market Cap (log)	Natural logarithm of the cross-sectional standard deviation of real market capitalization
Market Risk (CRSP VW Index)	Standard deviation of monthly returns of CRSP value-weighted index during calendar year
NBER Recessions	Indicator variable with value equal to 1 for months during an NBER-dated recession; 0 otherwise.
Panel C: Firm-level variables	
Capital Expenditures/Total Assets	Capital Expenditures/Total Assets
Cash and Short-term Investments/Total Assets	Cash and Short-term Investments / Total Assets
Citation Share/Total Assets	Sum of forward citations of all patents of firms in the industry issued in a year divided by the sum of the forward citations of all patents issued in the same year, scaled by the sum of total assets of all firms in the industry.
Citation-weighted Patents/Total Assets	(Sum over firms in an industry of $1 + [\text{citations of patent } j \text{ issued in year } t / \text{Average citations of all other patents issued in the same year}]$), divided by the sum of total assets of all firms in the industry
Firm Age	Difference in years between the observation date and the date of the first price on CRSP.
Idiosyncratic Risk (CLMX Model)	Idiosyncratic risk from CLMX model using daily returns in a month
Idiosyncratic Risk (Fama-French 5-Factor Model)	Idiosyncratic risk from Fama French 5-factor model
Idiosyncratic Risk (Market Model)	Idiosyncratic risk from market model
Illiquidity Ratio	Monthly average of (Absolute Stock Return/Stock Trading Volume)
Investment/Total Assets	(Capital Expenditure + R&D Expenses)/Total Assets
Leverage	(Total Debt + Preferred Stock) / (Total Debt + Preferred Stock + Market Capitalization)
Market Risk (Market Model)	Market risk from market model using daily returns in a month

(continued)

Appendix A: Variable Definitions (continued)

Variable	Definition
Nominal Patent Value/Total Assets	Nominal patent value divided by total assets. When at the industry level, the value of all patents is summed over all firms in the industry and divided by the sum of the total assets of the firms in the industry.
Nominal Patent Value/Total Assets Others	Sum of nominal patent value of other firms in the same FF48 industry divided by the sum of their total assets.
Operating Income/Total Assets	Operating Income/Total Assets
PPE (net) / Total Assets	Plant, Property & Equipment (net)/Total Assets
R&D Expenses/Total Assets	R&D Expenses/Total Assets. When at the industry level, R&D is summed over all firms in the industry and divided by the sum of the total assets of the firms in the industry.
R&D/Total Assets Others	Sum of R&D expenses of other firms in the same FF48 industry divided by the sum of their total assets.
Real Market Capitalization	Market capitalization in millions of 1997 dollars
ROE	Return on Equity (Net Income/Shareholders' Equity)
SG&A Expenses / Total Assets	SG&A Expenses (net of R&D Expenses) / Total Assets
Tobin's Q	(Total Assets – Book Value of Equity + Market Value of Equity)/Total Assets
Total Debt	Current Liabilities + Long-Term Debt

INTERNET APPENDIX

The number of listed firms, creative destruction, and idiosyncratic volatility

Söhnke M. Bartram, Gregory W. Brown, and René M. Stulz

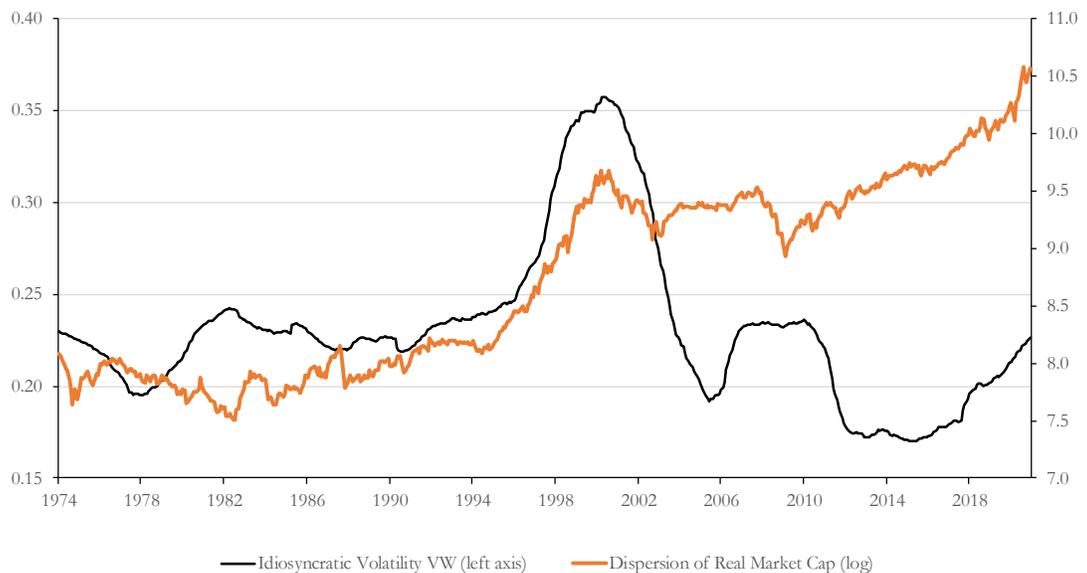
Internet Appendix Figure 1: Idiosyncratic Volatility and Dispersion of Real Market Capitalization over Time

The figure shows monthly aggregate average idiosyncratic volatility (IV) and dispersion in real market capitalization for U.S. firms over time. In particular, it shows centralized, 5-year moving averages of equal-weighted (Panel A) and value weighted (Panel B) IV, respectively. It also shows the natural logarithm of the monthly cross-sectional dispersion in real market capitalization. IV is estimated using the market model for each month using daily returns. Average IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). Dispersion of real market capitalization is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) at the end of the calendar month. The sample period is 1974 to 2020.

Panel A: Smoothed Equal-weighted Idiosyncratic Volatility



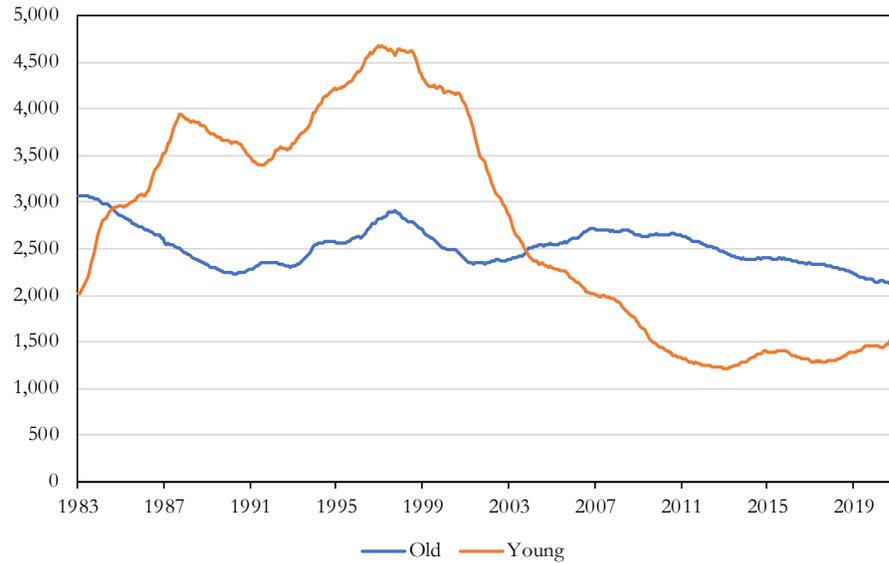
Panel B: Smoothed Value weighted Idiosyncratic Volatility



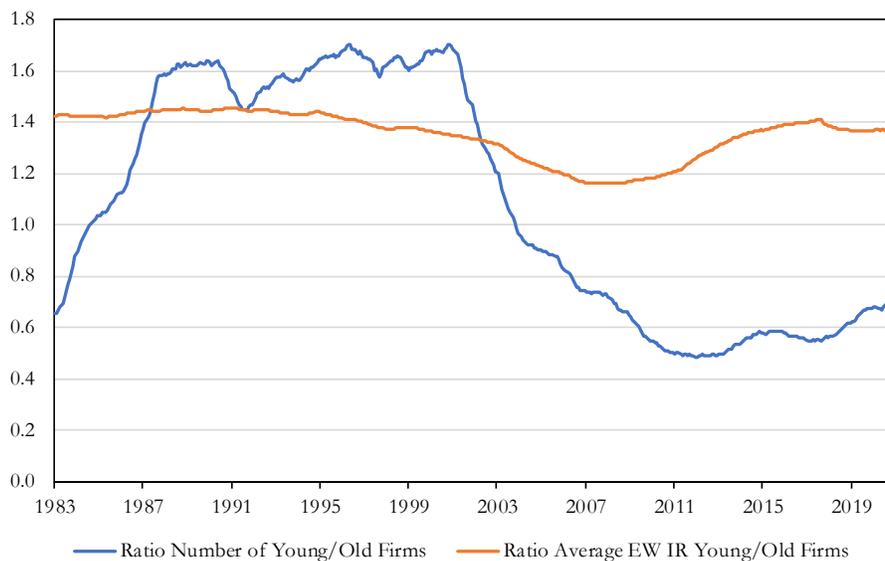
Internet Appendix Figure 2: Number, Fraction, and IV of Young Firms vs. Old Firms

The figure shows centralized, 5-year moving averages of monthly idiosyncratic volatility (IV) as well as the fraction and number of young and old firms over time. In particular, Panel A shows the number of listed firms separately for young firms and old firms. Panel B shows the ratio of the number of young and old firms and the ratio of the equal-weighted IV of young and old firms. Panel C shows the average equal-weighted IV of young and old firms. Panel D shows the average value weighted IV of young and old firms. IV is estimated using the market model for each month using daily returns. IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The number of firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar month. Young firms are firms with age of less or equal to 10 years; old firms are firms with age greater than 10 years. The sample period is 1983 to 2020.

Panel A: Number of Firms



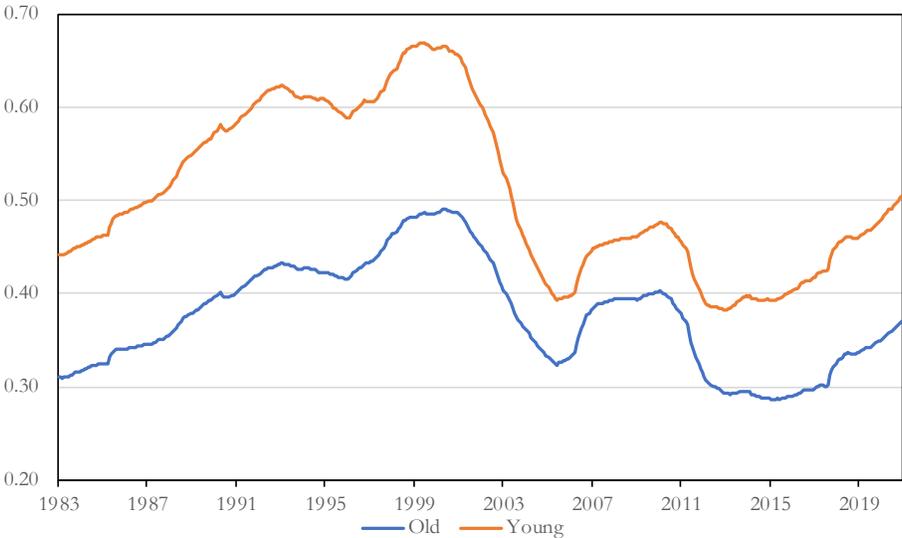
Panel B: Ratio of Number and of EW IV of Young and Old Firms



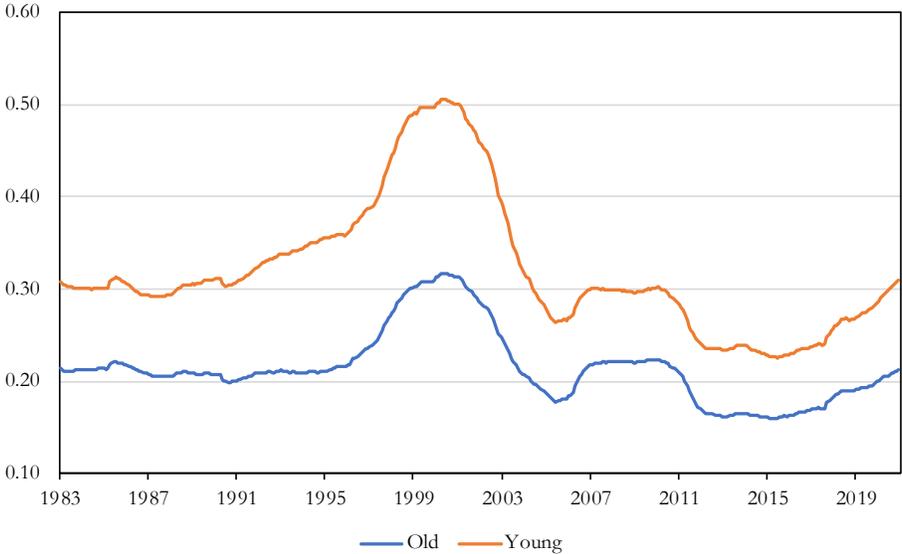
(continued)

Internet Appendix Figure 2: Number, Fraction, and IV of Young Firms vs. Old Firms (continued)

Panel C: Equal-weighted Idiosyncratic Volatility



Panel D: Value weighted Idiosyncratic Volatility



Internet Appendix Table 1: Firm-level Panel Regressions of Idiosyncratic Volatility on Firm Characteristics

The table shows results from panel regressions of the natural logarithm of annual firm-level idiosyncratic volatility (IV) on the lagged number of listed firms, lagged macro-economic variables, and lagged firm characteristics. It is based on old firms (age greater than 10 years). IV is estimated using the market model for each calendar year using daily data. The number of firms, credit spread, an indicator variable for NBER recessions, and the Chicago Fed Index are as of the last month of the calendar year, while the natural logarithm of market risk is the standard deviation of the monthly CRSP value weighted index return, and the CRSP value weighted return is cumulative over the year. The natural logarithm of the Amihud illiquidity ratio, SG&A expenses (scaled by total assets), R&D expenses (scaled by total assets), capital expenditures (scaled by total assets), and ROE are the average of the monthly values over the calendar year, while the natural logarithm of real market capitalization, the natural logarithm of firm age, the natural logarithm of Tobin's Q, leverage, PPE (net) (scaled by total assets), and the natural logarithm of cash and short-term investments (scaled by total assets) are as of the last month of the calendar year. The regressions include industry fixed effects. Standard errors are clustered by firm and year. The table reports regression coefficients and associated p -values, the adjusted regression R-Squared, and the number of observations. The sample consists of all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The number of firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3). The sample period is 1983 to 2020.

	(1)		(2)		(3)		(4)		(5)		(6)	
	Coef	p -value										
Number of Firms (lagged)			0.112	[0.00]			0.068	[0.01]			0.078	[0.01]
Market Risk (CRSP VW Index) (log) (lagged)	0.134	[0.09]	0.011	[0.85]					0.059	[0.42]	0.003	[0.96]
Credit Spread (lagged)	-0.119	[0.06]	0.013	[0.81]					-0.067	[0.25]	0.000	[1.00]
NBER Recessions (lagged)	0.046	[0.81]	-0.089	[0.51]					-0.125	[0.45]	-0.165	[0.23]
Chicago Fed Index (lagged)	-0.143	[0.13]	-0.134	[0.10]					-0.183	[0.05]	-0.170	[0.05]
CRSP VW-Return (lagged)	-0.005	[0.98]	0.030	[0.87]					0.007	[0.98]	0.040	[0.84]
Illiquidity Ratio (log) (lagged)					-0.019	[0.22]	-0.053	[0.00]	-0.018	[0.18]	-0.048	[0.00]
Real Market Capitalization (log) (lagged)					-0.161	[0.00]	-0.200	[0.00]	-0.160	[0.00]	-0.194	[0.00]
Firm Age (log) (lagged)					-0.082	[0.00]	-0.069	[0.00]	-0.089	[0.00]	-0.077	[0.00]
Tobin's Q (log) (lagged)					0.186	[0.00]	0.179	[0.00]	0.196	[0.00]	0.193	[0.00]
Leverage (lagged)					0.483	[0.00]	0.449	[0.00]	0.471	[0.00]	0.444	[0.00]
SG&A Expenses / Total Assets (lagged)					-0.008	[0.77]	-0.016	[0.55]	-0.006	[0.84]	-0.013	[0.63]
R&D/Total Assets (lagged)					0.704	[0.00]	0.645	[0.00]	0.647	[0.00]	0.587	[0.00]
PPE (net) / Total Assets (lagged)					-0.053	[0.22]	-0.063	[0.13]	-0.038	[0.37]	-0.043	[0.29]
Capital Expenditures/Total Assets (lagged)					0.571	[0.00]	0.402	[0.00]	0.528	[0.00]	0.356	[0.00]
Cash and Short-term Investments/Total Assets (log) (lagged)					-0.013	[0.80]	0.027	[0.55]	-0.014	[0.79]	0.024	[0.60]
ROE (lagged)					-0.242	[0.00]	-0.260	[0.00]	-0.256	[0.00]	-0.275	[0.00]
Adjusted R ²	0.08		0.12		0.46		0.47		0.48		0.50	
Observations	59,555		59,555		59,555		59,555		59,555		59,555	

Internet Appendix Table 2: Industry Panel Regressions

The table shows results from panel regressions of average idiosyncratic volatility (IV) on alternative listing variables at the industry level (48 Fama French industries). In particular, it regresses the percentage change in the centered, 5-year moving average of alternatively equal- and value weighted IV on the percentage change in the number of listed firms for lags of 1 to 5 years. Panel A shows results for old firms (firm age greater than 10 years) for the period 1983-2020. Panel B shows results for the sample period 1978 to 2020, but excluding 1998-2003. Panel C shows results excluding macro-economic variables for the period 1978 to 2020. Panel D shows results excluding TMT firms for the period 1978 to 2020. Panel E shows results for the period 1978 to 2020 excluding crisis periods. Panels B-E show results separately for all firms and old firms (firm age greater than 5 years). IV is estimated using the market model for each calendar year using daily returns. Except for Panel C, regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. The table reports regression coefficients and associated p -values, the (adjusted) regression R-Squared, and the number of observations. It also reports the sum of the coefficients of the listing variables and a test of it being equal to zero. IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The number of firms in an industry is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year.

Panel A: Firm Age > 10							
Percentage Change in 5-year Central Moving Average of IV (t)							
Equal-weighted Idiosyncratic				Value-weighted Idiosyncratic			
(1)		(2)		(1)		(2)	
Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Percent Change Number of Firms ($t-1$)	0.001 [0.98]			-0.003 [0.91]			
Percent Change Number of Firms ($t-2$)	0.056 [0.11]			0.053 [0.14]			
Percent Change Number of Firms ($t-3$)	0.080 [0.00]	0.086 [0.00]		0.058 [0.06]	0.064 [0.05]		
Percent Change Number of Firms ($t-4$)	0.076 [0.00]	0.080 [0.00]		0.045 [0.07]	0.048 [0.06]		
Percent Change Number of Firms ($t-5$)	0.049 [0.04]	0.052 [0.03]		0.033 [0.22]	0.036 [0.18]		
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.035 [0.20]	-0.035 [0.19]		-0.040 [0.18]	-0.040 [0.18]		
Credit Spread ($t-1$)	-0.036 [0.01]	-0.037 [0.00]		-0.047 [0.00]	-0.048 [0.00]		
NBER Recessions ($t-1$)	0.053 [0.22]	0.053 [0.25]		0.059 [0.30]	0.059 [0.33]		
Chicago Fed Index ($t-1$)	-0.022 [0.21]	-0.023 [0.22]		-0.037 [0.04]	-0.038 [0.05]		
CRSP VW-Return ($t-1$)	0.001 [0.98]	-0.003 [0.97]		0.039 [0.61]	0.036 [0.65]		
Sum Coef Listing Variables	0.261	0.218		0.185	0.148		
p -value (Test Sum of Coefficients)	[0.00]	[0.00]		[0.06]	[0.03]		
R ²	0.24	0.23		0.25	0.24		
Observations	1,554	1,554		1,554	1,554		

(continued)

Internet Appendix Table 2: Industry Panel Regressions (continued)

Panel B: Results excluding 1998-2003

	Percentage Change in 5-year Central Moving Average of IV (t)							
	Equal-weighted Idiosyncratic				Value-weighted Idiosyncratic			
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
All Firms								
Percent Change Number of Firms ($t-1$)	0.039	[0.22]			0.026	[0.26]		
Percent Change Number of Firms ($t-2$)	0.028	[0.38]			0.015	[0.48]		
Percent Change Number of Firms ($t-3$)	0.083	[0.00]	0.088	[0.00]	0.063	[0.03]	0.066	[0.03]
Percent Change Number of Firms ($t-4$)	0.053	[0.01]	0.058	[0.02]	0.025	[0.35]	0.029	[0.31]
Percent Change Number of Firms ($t-5$)	0.032	[0.24]	0.036	[0.17]	0.009	[0.71]	0.012	[0.63]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.035	[0.23]	-0.035	[0.23]	-0.051	[0.04]	-0.051	[0.04]
Credit Spread ($t-1$)	-0.036	[0.02]	-0.037	[0.02]	-0.048	[0.00]	-0.048	[0.00]
NBER Recessions ($t-1$)	-0.008	[0.82]	-0.010	[0.78]	-0.032	[0.36]	-0.033	[0.35]
Chicago Fed Index ($t-1$)	-0.034	[0.15]	-0.034	[0.16]	-0.056	[0.03]	-0.056	[0.03]
CRSP VW-Return ($t-1$)	-0.103	[0.13]	-0.111	[0.11]	-0.141	[0.04]	-0.145	[0.04]
Sum Coef Listing Variables	0.235		0.182		0.139		0.107	
p -value (Test Sum of Coefficients)	[0.01]		[0.00]		[0.06]		[0.09]	
R ²	0.19		0.18		0.24		0.24	
Observations	1,302		1,302		1,302		1,302	
Old Firms								
Percent Change Number of Firms ($t-1$)	-0.002	[0.95]			0.004	[0.88]		
Percent Change Number of Firms ($t-2$)	0.022	[0.47]			0.000	[0.99]		
Percent Change Number of Firms ($t-3$)	0.089	[0.00]	0.092	[0.00]	0.068	[0.03]	0.068	[0.03]
Percent Change Number of Firms ($t-4$)	0.086	[0.00]	0.087	[0.00]	0.040	[0.17]	0.040	[0.17]
Percent Change Number of Firms ($t-5$)	0.057	[0.04]	0.059	[0.03]	0.022	[0.32]	0.022	[0.31]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.032	[0.28]	-0.032	[0.28]	-0.051	[0.04]	-0.051	[0.04]
Credit Spread ($t-1$)	-0.035	[0.02]	-0.035	[0.02]	-0.046	[0.00]	-0.046	[0.00]
NBER Recessions ($t-1$)	-0.006	[0.86]	-0.008	[0.81]	-0.034	[0.34]	-0.034	[0.34]
Chicago Fed Index ($t-1$)	-0.033	[0.14]	-0.034	[0.13]	-0.055	[0.03]	-0.055	[0.03]
CRSP VW-Return ($t-1$)	-0.094	[0.15]	-0.099	[0.14]	-0.132	[0.04]	-0.132	[0.05]
Sum Coef Listing Variables	0.252		0.237		0.134		0.130	
p -value (Test Sum of Coefficients)	[0.01]		[0.00]		[0.08]		[0.05]	
R ²	0.19		0.19		0.23		0.23	
Observations	1,302		1,302		1,302		1,302	

(continued)

Internet Appendix Table 2: Industry Panel Regressions (continued)

Panel C: Results without Macroeconomic Variables

	Percentage Change in 5-year Central Moving Average of IV (t)							
	Equal-weighted Idiosyncratic				Value-weighted Idiosyncratic			
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
All Firms								
Percent Change Number of Firms ($t-1$)	0.081	[0.01]			0.061	[0.08]		
Percent Change Number of Firms ($t-2$)	0.090	[0.07]			0.094	[0.10]		
Percent Change Number of Firms ($t-3$)	0.091	[0.00]	0.107	[0.00]	0.076	[0.11]	0.090	[0.11]
Percent Change Number of Firms ($t-4$)	0.055	[0.08]	0.068	[0.07]	0.039	[0.41]	0.051	[0.32]
Percent Change Number of Firms ($t-5$)	0.012	[0.73]	0.020	[0.55]	0.014	[0.75]	0.022	[0.61]
Sum Coef Listing Variables	0.329		0.194		0.284		0.163	
p -value (Test Sum of Coefficients)	[0.01]		[0.02]		[0.12]		[0.22]	
R^2	0.10		0.06		0.06		0.03	
Observations	1,554		1,554		1,554		1,554	
Old Firms								
Percent Change Number of Firms ($t-1$)	0.039	[0.26]			0.039	[0.29]		
Percent Change Number of Firms ($t-2$)	0.079	[0.08]			0.079	[0.16]		
Percent Change Number of Firms ($t-3$)	0.098	[0.00]	0.109	[0.00]	0.081	[0.09]	0.093	[0.10]
Percent Change Number of Firms ($t-4$)	0.089	[0.00]	0.098	[0.01]	0.054	[0.28]	0.063	[0.24]
Percent Change Number of Firms ($t-5$)	0.046	[0.20]	0.052	[0.13]	0.028	[0.51]	0.035	[0.41]
Sum Coef Listing Variables	0.350		0.259		0.282		0.190	
p -value (Test Sum of Coefficients)	[0.01]		[0.00]		[0.14]		[0.17]	
R^2	0.11		0.08		0.05		0.04	
Observations	1,554		1,554		1,554		1,554	

(continued)

Internet Appendix Table 2: Industry Panel Regressions (continued)

Panel D: Results excluding TMT firms

	Percentage Change in 5-year Central Moving Average of IV (t)							
	Equal-weighted Idiosyncratic				Value-weighted Idiosyncratic			
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
All Firms								
Percent Change Number of Firms ($t-1$)	0.052	[0.13]			0.022	[0.45]		
Percent Change Number of Firms ($t-2$)	0.076	[0.05]			0.075	[0.02]		
Percent Change Number of Firms ($t-3$)	0.081	[0.00]	0.094	[0.00]	0.066	[0.07]	0.077	[0.04]
Percent Change Number of Firms ($t-4$)	0.061	[0.04]	0.072	[0.05]	0.049	[0.11]	0.057	[0.08]
Percent Change Number of Firms ($t-5$)	0.027	[0.19]	0.035	[0.09]	0.033	[0.21]	0.040	[0.12]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.035	[0.20]	-0.037	[0.18]	-0.041	[0.16]	-0.041	[0.16]
Credit Spread ($t-1$)	-0.031	[0.03]	-0.033	[0.02]	-0.046	[0.00]	-0.049	[0.00]
NBER Recessions ($t-1$)	0.060	[0.19]	0.064	[0.22]	0.058	[0.30]	0.060	[0.33]
Chicago Fed Index ($t-1$)	-0.019	[0.33]	-0.017	[0.41]	-0.038	[0.03]	-0.037	[0.05]
CRSP VW-Return ($t-1$)	0.016	[0.80]	0.011	[0.86]	0.032	[0.68]	0.027	[0.73]
Sum Coef Listing Variables	0.297		0.201		0.245		0.174	
p -value (Test Sum of Coefficients)	[0.01]		[0.01]		[0.01]		[0.03]	
R ²	0.26		0.24		0.27		0.26	
Observations	1,554		1,554		1,554		1,554	
Old Firms								
Percent Change Number of Firms ($t-1$)	0.014	[0.70]			0.001	[0.98]		
Percent Change Number of Firms ($t-2$)	0.067	[0.07]			0.060	[0.05]		
Percent Change Number of Firms ($t-3$)	0.088	[0.00]	0.097	[0.00]	0.069	[0.06]	0.077	[0.04]
Percent Change Number of Firms ($t-4$)	0.093	[0.00]	0.100	[0.00]	0.060	[0.04]	0.065	[0.04]
Percent Change Number of Firms ($t-5$)	0.053	[0.01]	0.059	[0.01]	0.045	[0.09]	0.050	[0.05]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.030	[0.29]	-0.030	[0.28]	-0.040	[0.17]	-0.040	[0.17]
Credit Spread ($t-1$)	-0.030	[0.02]	-0.032	[0.02]	-0.045	[0.01]	-0.047	[0.00]
NBER Recessions ($t-1$)	0.055	[0.18]	0.057	[0.22]	0.054	[0.33]	0.055	[0.35]
Chicago Fed Index ($t-1$)	-0.020	[0.29]	-0.019	[0.33]	-0.038	[0.03]	-0.038	[0.04]
CRSP VW-Return ($t-1$)	0.017	[0.78]	0.013	[0.83]	0.039	[0.61]	0.035	[0.65]
Sum Coef Listing Variables	0.316		0.256		0.236		0.192	
p -value (Test Sum of Coefficients)	[0.00]		[0.00]		[0.02]		[0.02]	
R ²	0.26		0.24		0.26		0.25	
Observations	1,554		1,554		1,554		1,554	

(continued)

Internet Appendix Table 2: Industry Panel Regressions (continued)

Panel E: Results excluding Crisis Periods

	Percentage Change in 5-year Central Moving Average of IV (t)							
	Equal-weighted Idiosyncratic				Value-weighted Idiosyncratic			
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
All Firms								
Percent Change Number of Firms ($t-1$)	0.030	[0.38]			0.000	[0.99]		
Percent Change Number of Firms ($t-2$)	0.053	[0.14]			0.048	[0.08]		
Percent Change Number of Firms ($t-3$)	0.076	[0.02]	0.085	[0.01]	0.055	[0.20]	0.062	[0.16]
Percent Change Number of Firms ($t-4$)	0.033	[0.26]	0.034	[0.27]	0.020	[0.51]	0.020	[0.49]
Percent Change Number of Firms ($t-5$)	0.037	[0.13]	0.041	[0.09]	0.036	[0.18]	0.039	[0.14]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.027	[0.41]	-0.026	[0.42]	-0.028	[0.47]	-0.027	[0.48]
Credit Spread ($t-1$)	-0.057	[0.03]	-0.062	[0.02]	-0.076	[0.01]	-0.080	[0.01]
NBER Recessions ($t-1$)	0.020	[0.48]	0.016	[0.56]	0.007	[0.79]	0.005	[0.87]
Chicago Fed Index ($t-1$)	-0.021	[0.35]	-0.021	[0.36]	-0.035	[0.12]	-0.036	[0.12]
CRSP VW-Return ($t-1$)	-0.006	[0.94]	-0.010	[0.89]	0.016	[0.85]	0.013	[0.89]
Sum Coef Listing Variables	0.229		0.159		0.158		0.120	
p -value (Test Sum of Coefficients)	[0.03]		[0.01]		[0.12]		[0.12]	
R ²	0.29		0.28		0.30		0.30	
Observations	1,386		1,386		1,386		1,386	
Old Firms								
Percent Change Number of Firms ($t-1$)	-0.015	[0.64]			-0.023	[0.48]		
Percent Change Number of Firms ($t-2$)	0.043	[0.20]			0.034	[0.21]		
Percent Change Number of Firms ($t-3$)	0.088	[0.01]	0.094	[0.01]	0.063	[0.15]	0.067	[0.14]
Percent Change Number of Firms ($t-4$)	0.068	[0.02]	0.068	[0.02]	0.033	[0.29]	0.033	[0.28]
Percent Change Number of Firms ($t-5$)	0.067	[0.02]	0.068	[0.01]	0.050	[0.06]	0.050	[0.05]
Market Risk (CRSP VW Index) (log) ($t-1$)	-0.024	[0.47]	-0.023	[0.50]	-0.027	[0.47]	-0.026	[0.49]
Credit Spread ($t-1$)	-0.055	[0.03]	-0.057	[0.04]	-0.075	[0.01]	-0.076	[0.01]
NBER Recessions ($t-1$)	0.019	[0.47]	0.016	[0.54]	0.004	[0.90]	0.001	[0.96]
Chicago Fed Index ($t-1$)	-0.023	[0.30]	-0.024	[0.29]	-0.036	[0.11]	-0.037	[0.11]
CRSP VW-Return ($t-1$)	-0.006	[0.94]	-0.008	[0.91]	0.023	[0.79]	0.021	[0.81]
Sum Coef Listing Variables	0.251		0.230		0.156		0.150	
p -value (Test Sum of Coefficients)	[0.02]		[0.00]		[0.13]		[0.07]	
R ²	0.29		0.28		0.29		0.29	
Observations	1,386		1,386		1,386		1,386	

Internet Appendix Table 3: First Stage of Instrumental Variables Regressions

The table shows results from panel regressions of the percentage change in the number of listed firms on instrumental variables at the industry level (48 Fama French industries). The regressions constitute the first stage regressions to the second stage regressions in Table 4b. The percentage change in the number of listed firms is calculated alternatively over five or three years. The instrumental variable is the percentage change in the number of related firms, calculated alternatively over five or three years. It is also included with one lag. The number of related firms is based on the number for firms in the corresponding Fama French 12 industry classification minus the number of firms in the focal Fama French 48 industry. Where SIC codes of Fama French 48 industries map into more than one Fama French 12 industries, the instrument is based on a weighted average of the number of firms in the corresponding Fama French 12 industries. Results are reported alternatively for regressions that include or exclude lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. The table reports regression coefficients and associated p-values, the partial R-Squared, the number of observations, and an F-test on the instruments. The sample is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The number of firms in an industry is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. The sample period is 1978 to 2020.

	Percent Change Number of Firms ($t-1$) (past 5 years)		Percent Change Number of Firms ($t-3$) (past 3 years)		Percent Change Number of Firms ($t-1$) (past 5 years)		Percent Change Number of Firms ($t-3$) (past 3 years)	
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Regressions with Macroeconomic Controls and Industry Fixed Effects								
Percent Change Instrument FF12 ($t-1$) (past 5 years)	0.384	[0.00]			0.384	[0.00]		
Percent Change Instrument FF12 ($t-2$) (past 5 years)	0.081	[0.41]			0.081	[0.41]		
Percent Change Instrument FF12 ($t-3$) (past 3 years)			0.418	[0.00]			0.418	[0.00]
Percent Change Instrument FF12 ($t-4$) (past 3 years)			-0.002	[0.98]			-0.002	[0.98]
Partial R ²	0.02		0.02		0.02		0.02	
Observations	1,478		1,478		1,478		1,478	
F-Test Instruments	15.8		15.7		15.8		15.7	
<i>p</i> -value	[0.00]		[0.00]		[0.00]		[0.00]	
Regressions with Industry Fixed Effects								
Percent Change Instrument FF12 ($t-1$) (past 5 years)	0.369	[0.01]			0.369	[0.01]		
Percent Change Instrument FF12 ($t-2$) (past 5 years)	0.113	[0.33]			0.113	[0.33]		
Percent Change Instrument FF12 ($t-3$) (past 3 years)			0.427	[0.00]			0.427	[0.00]
Percent Change Instrument FF12 ($t-4$) (past 3 years)			0.042	[0.50]			0.042	[0.50]
Partial R ²	0.02		0.03		0.02		0.03	
Observations	1,478		1,478		1,478		1,478	
F-Test Instruments	13.9		21.1		13.9		21.1	
<i>p</i> -value	[0.00]		[0.00]		[0.00]		[0.00]	

Internet Appendix Table 4: Alternative Instrumental Variables Regressions

The table shows results from panel regressions of average idiosyncratic volatility (IV) on alternative listing variables at the industry level (48 Fama French industries). Panel A shows second-stage results of industry panel regressions with instrumented variables. It regresses the percentage change in the centered, 5-year moving average of alternatively equal- and value weighted IV on the percentage change in the number of listed firms over 5 or 3 years, lagged by one and three years respectively. Regressions include macro-economic variables and industry fixed effects. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. The instruments are the weighted average of number of firms in the corresponding 5, 12, or 38 Fama French Industries, excluding the focal industry. The panel reports regression coefficients and associated p -values, the (adjusted) regression R-Squared, and the number of observations. It also reports underidentification (Kleibergen–Paap rk LM), weak instruments (Kleibergen–Paap rk Wald F), and overidentification (Hansen J) test statistics and corresponding p -values. Panel B shows the corresponding first stage regressions. The percentage change in the number of listed firms is calculated alternatively over five or three years. The instrumental variable is the percentage change in the number of related firms, calculated alternatively over five or three years. The number of related firms is based on the number for firms in the corresponding Fama French 5 (12 or 38) industry classification minus the number of firms in the focal Fama French 48 industry. Where SIC codes of Fama French 48 industries map into more than one Fama French 5 (12 or 38) industries, the instrument is based on a weighted average of the number of firms in the corresponding Fama French 5 (12 or 38) industries. The panel reports regression coefficients and associated p -values, the partial R-Squared, the number of observations, and an F-test on the instruments. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. IV is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The number of firms in an industry is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. The sample period is 1978 to 2020.

(continued)

Internet Appendix Table 4: Alternative Instrumental Variables Regressions (continued)

Panel A: Second Stage Regressions

	Percentage Change in 5-year Central Moving Average of IV (t)							
	Equal-weighted Idiosyncratic Volatility				Value-weighted Idiosyncratic Volatility			
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Instrument uses weighted average of corresponding FF12 and FF5 industries								
Percent Change Number of Firms ($t-1$) (past 5 years)	0.121	[0.00]			0.117	[0.07]		
Percent Change Number of Firms ($t-3$) (past 3 years)			0.286	[0.00]			0.304	[0.04]
R ²	0.13		-0.06		0.12		-0.04	
Observations	1,520		1,520		1,520		1,520	
Underidentification (Kleibergen–Paap rk LM)	5.43		6.11		5.43		6.11	
<i>p</i> -value	[0.07]		[0.05]		[0.07]		[0.05]	
Weak instruments (Kleibergen–Paap rk Wald F)	234.6		57.2		234.6		57.2	
Overidentification (Hansen J)	0.06		0.47		0.04		0.63	
<i>p</i> -value	[0.81]		[0.49]		[0.84]		[0.43]	
Instrument uses weighted average of corresponding FF12 and FF38 industries								
Percent Change Number of Firms ($t-1$) (past 5 years)	0.113	[0.01]			0.107	[0.11]		
Percent Change Number of Firms ($t-3$) (past 3 years)			0.250	[0.01]			0.254	[0.08]
R ²	0.14		0.03		0.12		0.05	
Observations	1,341		1,341		1,341		1,341	
Underidentification (Kleibergen–Paap rk LM)	6.00		6.76		6.00		6.76	
<i>p</i> -value	[0.05]		[0.03]		[0.05]		[0.03]	
Weak instruments (Kleibergen–Paap rk Wald F)	32.3		19.3		32.3		19.3	
Overidentification (Hansen J)	1.59		1.65		0.05		0.07	
<i>p</i> -value	[0.21]		[0.20]		[0.82]		[0.79]	

(continued)

Internet Appendix Table 4: Alternative Instrumental Variables Regressions (continued)

Panel B: First Stage Regressions

	Percent Change Number of Firms ($t-1$) (past 5 years)		Percent Change Number of Firms ($t-3$) (past 3 years)		Percent Change Number of Firms ($t-1$) (past 5 years)		Percent Change Number of Firms ($t-3$) (past 3 years)	
	(1)		(2)		(1)		(2)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Instrument uses weighted average of corresponding FF12 and FF5 industries								
Percent Change Instrument FF12 ($t-1$) (past 5 years)	0.002	[0.98]			0.002	[0.98]		
Percent Change Instrument FF5 ($t-1$) (past 5 years)	0.781	[0.00]			0.781	[0.00]		
Percent Change Instrument FF12 ($t-3$) (past 3 years)			0.073	[0.22]			0.073	[0.22]
Percent Change Instrument FF5 ($t-3$) (past 3 years)			0.609	[0.00]			0.609	[0.00]
Partial R ²	0.24		0.07		0.24		0.07	
Observations	1,520		1,520		1,520		1,520	
F-Test Instruments	234.6		57.2		234.6		57.2	
<i>p</i> -value	[0.00]		[0.00]		[0.00]		[0.00]	
Instrument uses weighted average of corresponding FF12 and FF38 industries								
Percent Change Instrument FF12 ($t-1$) (past 5 years)	0.458	[0.00]			0.458	[0.00]		
Percent Change Instrument FF38 ($t-1$) (past 5 years)	0.070	[0.00]			0.070	[0.00]		
Percent Change Instrument FF12 ($t-3$) (past 3 years)			0.393	[0.00]			0.393	[0.00]
Percent Change Instrument FF38 ($t-3$) (past 3 years)			0.026	[0.00]			0.026	[0.00]
Partial R ²	0.05		0.03		0.05		0.03	
Observations	1,341		1,341		1,341		1,341	
F-Test Instruments	32.3		19.3		32.3		19.3	
<i>p</i> -value	[0.00]		[0.00]		[0.00]		[0.00]	

Internet Appendix Table 5: Industry Panel Regressions with Census Firms and VC Firms

The table shows results from regressions with average idiosyncratic volatility (IV) and the number of listed, Census and VC firms. Panel B estimates panel regressions at the industry level (48 Fama French industries). In particular, it regresses percentage changes in the centered, 5-year moving average of equal-weighted IV on percentage changes in the number of listed, Census and VC firms for lags of 1 to 5 years. IV is estimated using the market model for each calendar year using daily data. It is based on all common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) excluding penny stocks with prices less than \$1.00 (in January 1997 dollars). The number of listed firms is based on the number of common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. The number of Census firms applies alternatively a threshold of 20 and 100 employees. VC firm variables are set to zero if missing. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. The table reports regression coefficients and associated p -values, the adjusted regression R-Squared, and the number of observations. Separately for listed firms, Census firms, and VC firms, it reports the sum of the coefficients of the listing variables and a test of it being equal to zero. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

(continued)

Internet Appendix Table 5: Industry Panel Regressions with Census Firms and VC Firms (continued)

	Percentage Change in IV in 5-year Central Moving Average (<i>t</i>)															
	Equal-weighted Idiosyncratic Volatility						Value-weighted Idiosyncratic Volatility									
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Percentage Change Number of Listed Firms (<i>t</i> -1)	0.040	[0.30]	0.040	[0.29]					0.011	[0.77]	0.010	[0.78]				
Percentage Change Number of Listed Firms (<i>t</i> -2)	0.074	[0.10]	0.079	[0.07]					0.061	[0.13]	0.068	[0.08]				
Percentage Change Number of Listed Firms (<i>t</i> -3)	0.053	[0.02]	0.056	[0.01]	0.086	[0.01]	0.086	[0.00]	0.038	[0.20]	0.040	[0.17]	0.066	[0.06]	0.066	[0.06]
Percentage Change Number of Listed Firms (<i>t</i> -4)	0.040	[0.12]	0.038	[0.11]	0.056	[0.10]	0.059	[0.06]	0.021	[0.39]	0.019	[0.41]	0.034	[0.22]	0.035	[0.16]
Percentage Change Number of Listed Firms (<i>t</i> -5)	0.013	[0.55]	0.008	[0.70]	0.024	[0.33]	0.023	[0.34]	0.013	[0.65]	0.011	[0.71]	0.023	[0.45]	0.023	[0.45]
Percentage Change Number of Census Firms > 20 (<i>t</i> -1)	0.169	[0.07]							0.192	[0.11]						
Percentage Change Number of Census Firms > 20 (<i>t</i> -2)	0.151	[0.03]							0.114	[0.13]						
Percentage Change Number of Census Firms > 20 (<i>t</i> -3)	0.038	[0.48]			0.095	[0.12]			0.018	[0.81]			0.061	[0.40]		
Percentage Change Number of Census Firms > 20 (<i>t</i> -4)	0.014	[0.90]			0.025	[0.83]			0.031	[0.78]			0.045	[0.70]		
Percentage Change Number of Census Firms > 20 (<i>t</i> -5)	0.025	[0.67]			0.023	[0.69]			-0.057	[0.44]			-0.065	[0.36]		
Percentage Change Number of Census Firms > 100 (<i>t</i> -1)			0.166	[0.00]							0.167	[0.02]				
Percentage Change Number of Census Firms > 100 (<i>t</i> -2)			0.101	[0.12]							0.069	[0.27]				
Percentage Change Number of Census Firms > 100 (<i>t</i> -3)			0.093	[0.06]			0.103	[0.07]			0.059	[0.24]			0.065	[0.25]
Percentage Change Number of Census Firms > 100 (<i>t</i> -4)			0.013	[0.87]			-0.004	[0.96]			0.024	[0.79]			0.004	[0.97]
Percentage Change Number of Census Firms > 100 (<i>t</i> -5)			0.040	[0.43]			0.042	[0.37]			-0.023	[0.70]			-0.022	[0.70]
Percentage Change Number of VC Firms (<i>t</i> -1)	-0.001	[0.57]	-0.001	[0.57]					0.003	[0.36]	0.003	[0.35]				
Percentage Change Number of VC Firms (<i>t</i> -2)	0.000	[0.99]	0.000	[0.95]					0.006	[0.12]	0.006	[0.15]				
Percentage Change Number of VC Firms (<i>t</i> -3)	0.001	[0.76]	0.001	[0.80]	0.001	[0.71]	0.001	[0.70]	0.005	[0.18]	0.004	[0.20]	0.003	[0.25]	0.003	[0.24]
Percentage Change Number of VC Firms (<i>t</i> -4)	-0.004	[0.26]	-0.004	[0.26]	-0.005	[0.16]	-0.006	[0.15]	0.000	[0.93]	0.000	[0.93]	-0.001	[0.83]	-0.001	[0.84]
Percentage Change Number of VC Firms (<i>t</i> -5)	-0.004	[0.34]	-0.004	[0.31]	-0.005	[0.28]	-0.005	[0.29]	0.002	[0.66]	0.002	[0.70]	0.001	[0.76]	0.001	[0.77]
Sum Coef Listing Variables Listed	0.219		0.222		0.166		0.169		0.143		0.148		0.123		0.124	
Sum Coef Listing Variables Census	0.396		0.413		0.143		0.140		0.298		0.296		0.041		0.047	
Sum Coef Listing Variables VC	-0.008		-0.008		-0.009		-0.009		0.016		0.016		0.004		0.004	
<i>p</i> -value (Test Sum of Coefficients Listed)	[0.07]		[0.06]		[0.03]		[0.02]		[0.20]		[0.16]		[0.11]		[0.09]	
<i>p</i> -value (Test Sum of Coefficients Census)	[0.06]		[0.05]		[0.37]		[0.36]		[0.18]		[0.18]		[0.81]		[0.78]	
<i>p</i> -value (Test Sum of Coefficients VC)	[0.62]		[0.58]		[0.36]		[0.36]		[0.32]		[0.34]		[0.73]		[0.72]	
Adjusted R ²	0.11		0.11		0.05		0.06		0.06		0.06		0.02		0.02	
Observations	1,443		1,443		1,443		1,443		1,443		1,443		1,443		1,443	

Internet Appendix Table 6: Industry Panel Regressions of Proxies for Creative Disruption on Listing Variables with VC Firms

The table shows results from panel regressions of annual proxies for creative destruction on the number of listed, Census and VC firms at the industry level (48 Fama French industries). Proxies for creative destruction are the cross-sectional standard deviation of operating income/total assets and investment/total assets within an industry. Investment is the sum of capital expenditure and R&D expenses. Proxies for creative destruction are based on accounting data of all firms in Compustat and assigned to the calendar year with its most overlap. Percentage changes in proxies of creative destruction from year $t-5$ to year t are regressed on percentage changes in the number of listed, Census and VC firms in an industry lagged by 1 to 5 years. The number of listed firms is based on common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or Nasdaq (CRSP exchange codes 1, 2, and 3) as of the end of the calendar year. The number of Census firms uses a threshold of alternatively 20 and 100 employees. VC firm variables are set to zero if missing. Regressions include lagged market risk (the natural logarithm of the annualized standard deviation of the CRSP value-weighted market index), the credit spread, an indicator variable for NBER recessions, the Chicago Fed Index, and the CRSP value weighted return. Regressions also include industry fixed effects. The table reports regression coefficients and associated p -values, the (adjusted) regression R-Squared, and the number of observations. Separately for listed firms, Census firms and VC firms, it reports the sum of the coefficients of the listing variables, and a test of it being equal to zero. Standard errors are based on Driscoll and Kraay (1998) with 5 lags. We drop firms in Fama French 48 industries Utilities, Banking, Insurance, Real Estate, Trading, and Miscellaneous. The sample period is 1978 to 2020.

(continued)

Internet Appendix Table 6: Industry Panel Regressions of Proxies for Creative Disruption on Listing Variables with VC Firms
(continued)

	Census Firms ≥ 20				Census Firms ≥ 100			
	Percentage Change (t) (past 5 years)							
	Standard Deviation of Operating Income/Total Assets		Standard Deviation of Investment/Total Assets		Standard Deviation of Operating Income/Total Assets		Standard Deviation of Investment/Total Assets	
	Coef	p -value	Coef	p -value	Coef	p -value	Coef	p -value
Percent Change Number of Listed Firms (t-1)	0.566	[0.00]	0.619	[0.00]	0.560	[0.00]	0.616	[0.00]
Percent Change Number of Listed Firms (t-2)	0.255	[0.08]	0.314	[0.00]	0.251	[0.08]	0.312	[0.00]
Percent Change Number of Listed Firms (t-3)	0.156	[0.60]	0.166	[0.13]	0.184	[0.53]	0.162	[0.14]
Percent Change Number of Listed Firms (t-4)	-0.038	[0.89]	0.290	[0.15]	-0.010	[0.97]	0.273	[0.17]
Percent Change Number of Listed Firms (t-5)	0.276	[0.14]	0.246	[0.05]	0.256	[0.16]	0.194	[0.10]
Percent Change Number of Census Firms (t-1)	-0.413	[0.52]	-0.342	[0.39]	0.168	[0.64]	-0.030	[0.93]
Percent Change Number of Census Firms (t-2)	1.212	[0.00]	0.576	[0.06]	0.343	[0.40]	0.122	[0.61]
Percent Change Number of Census Firms (t-3)	0.533	[0.18]	-0.030	[0.89]	0.275	[0.41]	-0.186	[0.27]
Percent Change Number of Census Firms (t-4)	0.070	[0.84]	-0.641	[0.04]	0.202	[0.57]	-0.259	[0.30]
Percent Change Number of Census Firms (t-5)	-0.976	[0.04]	-1.108	[0.00]	-0.189	[0.47]	-0.327	[0.04]
Percentage Change Number of VC Firms (t-1)	-0.011	[0.72]	-0.014	[0.49]	-0.012	[0.69]	-0.015	[0.47]
Percentage Change Number of VC Firms (t-2)	-0.007	[0.76]	-0.013	[0.39]	-0.009	[0.71]	-0.013	[0.39]
Percentage Change Number of VC Firms (t-3)	0.001	[0.96]	0.002	[0.87]	0.002	[0.91]	0.005	[0.72]
Percentage Change Number of VC Firms (t-4)	0.005	[0.85]	0.022	[0.35]	0.006	[0.81]	0.024	[0.27]
Percentage Change Number of VC Firms (t-5)	0.011	[0.70]	0.017	[0.15]	0.010	[0.72]	0.018	[0.12]
Sum Coef Listing Variables Listed	1.216		1.634		1.241		1.557	
Sum Coef Listing Variables Census	0.426		-1.546		0.798		-0.679	
Sum Coef Listing Variables VC	-0.002		0.014		-0.003		0.020	
p -value (Test Sum of Coefficients Listed)	[0.04]		[0.00]		[0.02]		[0.00]	
p -value (Test Sum of Coefficients Census)	[0.66]		[0.00]		[0.32]		[0.20]	
p -value (Test Sum of Coefficients VC)	[0.98]		[0.71]		[0.96]		[0.61]	
Adjusted R ²	0.09		0.11		0.08		0.10	
Observations	1,443		1,443		1,443		1,443	