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Are U.S. firms becoming more short-term oriented? Evidence of shifting firm time horizons from implied discount rates, 1980–2013

Rachelle C. Sampson[1] | **Yuan Shi**[2]

[1]RH Smith School of Business, University of Maryland, College Park, Maryland

[2]School of Hotel Administration, SC Johnson College of Business, Cornell University, Ithaca, New York

Correspondence
Rachelle C. Sampson, RH Smith School of Business, University of Maryland, College Park, MD 20742.
Email: rsampson@rhsmith.umd.edu

Abstract

Research Summary: We provide evidence that investors in U.S. public markets are increasingly discounting firms' expected future cash flows during 1980–2013. This trend is shown not only on average across firms, but also within firms over time after alternative explanations are accounted for. To corroborate a link with firm time horizons, we estimate the relationship between an implied discount rate ("IDR") and factors relevant to firm long-term strategy. We find that IDR is correlated in expected ways with firm investments, management incentives, financial health, ownership, and external pressures—measures that have been argued to correlate with firm time horizons. This article represents one of the first attempts to document market-wide evidence of shortening firm time horizons. These changing horizons bear important implications for firm strategy.

Managerial Summary: Whether U.S. firms have become more short-term oriented remains an active debate among managers, investors, researchers, and policymakers. In this study, we report that investors have been increasingly discounting the expected future returns of public firms over the last three decades. We find that a firm's discounting rate is explained by signals of its long-term strategy, including investment decisions, ownership structure, financial health, executive compensation scheme, and short-term pressures from the external environment. Our findings indicate a market-wide contraction of firm time horizons, highlighting firm characteristics that suggest how and why firms differ in their time horizons. These demonstrated relationships may help guide firms in devising investment strategies as well as external communications to attract investors that share a firm's preferred time horizon.

KEYWORDS

CEO compensation, institutional investing, myopia, R&D investment, short termism, time horizons

1 | INTRODUCTION

In recent years, there has been increased focus on corporate short termism by firms and academics alike. Concerns have been raised that U.S. firms are increasingly focused on managing quarterly earnings at the expense of investments in sustained, long-term growth (e.g., Laverty, 1996; Porter, 1992). Daniel Vasella, former chairman and CEO of Novartis AG, described these short-term pressures and their implications for firm strategy (Vasella & Leaf, 2002):

> "Once you get under the domination of making the quarter—even unwittingly—you start to compromise in the gray areas of your business, that wide swath of terrain between the top and bottom lines. Perhaps you'll begin to sacrifice things (such as funding a promising research-and-development project, incremental improvements to your products, customer service, employee training, expansion into new markets, and yes, community outreach) that are important and that may be vital for your company over the long term."

Implicit in this quote is the notion that public firms are shifting to favor short over long-term returns and empirical research provides some support for this inference. Surveys confirm that firms apply investment hurdle rates higher than suggested by the cost of capital (Meier & Tarhan, 2007; Poterba & Summers, 1995)[1] and, thus, forgo profitable investments in order to make earnings targets (e.g., Graham, Harvey, & Rajgopal, 2005). Larger scale empirical studies show that this behavior is reflected in financial markets; at the industry level, time horizons appear to be contracting (Davies, Haldane, Nielsen, & Pezzini, 2014; Miles, 1993). However,

[1]Fortune 1,000 CEOs report using an average discount rate of 12.2%, significantly higher than the average rate of return for equity holders (Poterba & Summers, 1995). More recently, Mankins, Harris, and Harding (2017) also show that firms apply investment hurdle rates higher than the cost of capital. See also the survey by the Manufacturers Alliance for Productivity and Innovation, "Lowering the Bar: Hurdle Rates," https://www.mapi.net/blog/2016/04/lowering-bar-hurdle-rates.

there are reasons to be skeptical, despite widespread perceptions that firms are becoming more short-term oriented. For example, price earnings ratios are at historic highs (see, e.g., Kaplan, 2017), suggesting greater optimism about long-term firm growth that is perhaps driven by firm behavior consistent with generating longer-term returns. Within firms, R&D spending, which presumably has a longer-term payoff, is at an all-time high; R&D grew from \$30.93B in 1980 to \$297.28B in 2013 (NSF, 2016).

In this article, we examine whether and how firm time horizons are changing over time. Using a market-based measure that we argue reflects firm time horizons, we seek to answer two questions: (a) are firms becoming more short-term oriented over time? and (b) do firm time horizons differ cross sectionally and, if so, what explains differences between firms? Our empirical approach allows us to identify broad trends as well as address whether similar strategies are viewed by investors as equally valuable across firms.[2] Providing such evidence is critical to resolving the debate around short termism in order to explore the implications of the role of time in firm strategy.

To answer these questions, we employ a measure of a firm's implied discount rate (IDR) to capture how much investors discount future expected cash flows and values. This measure has been previously estimated at the market and industry level to examine discounting trends in the United Kingdom and, to a more limited extent, the U.S. market (Davies et al., 2014; Miles, 1993). To better evaluate the strategic implications of firm time horizons, we go beyond this earlier work to estimate a firm-level measure of market discounting, which we call IDR. We use this measure as an indicator of firm time horizons for all U.S. public firms, specifically tracking how IDR moves over time and varies between firms.

In robustness checks, we also estimate alternative measures, including one based on analyst earnings forecasts in future periods, to ensure the validity of our reported trends. Our firm level measures allow us to not only establish market-wide trends, but also to reveal sources of firm heterogeneity in IDR not explained by market-wide indicators, providing richer, more fine-grained information to interpret identified trends and define implications for long-term firm strategy. Given the increasing influence of financial markets on firm strategy, understanding how markets view differences between firms and how this reflects firm time horizons is essential.

We find evidence consistent with contracting time horizons; markets are increasingly discounting firms' future prospects on average. We also observe increased discounting *within* most firms over time. While this general upward trend is persistent throughout the observation period, important shifts occur. Firms are discounted more heavily by the market following economy wide shocks, such as the dot-com bubble of 1999–2000 and the financial crisis of 2007–2008. This finding is consistent with expectations around these events; broad market uncertainty is correlated with more significant, economy-wide discounting of firm future cash flows. While we do not formally unpack the sources of the overall trend, some potential explanations include rising exposure to globalization and the increasing pace of technological change that may make firms more impatient for returns and less willing to take on the risks associated with longer-term investments. This conjecture is consistent with assumptions in behavioral finance and largely consistent with "rational" models.[3]

[2]In this sense, we examine whether strategy effectiveness depends upon the identity of the firm (see, e.g., Chung & Alcácer, 2002; Knott, 2008).

[3]The behavioral research shows that rising uncertainty exacerbates myopic loss aversion, creating a preference for short-term returns (e.g., Benartzi & Thaler, 1995), while "rational" finance models would interpret our results as consistent with unincluded risk factors (e.g., Fama & French, 2008). We briefly discuss the assumptions that underlie our estimation in Section 2 and take up the implications for interpretation in Section 3.2.

In addition to the general trend shown, we observe significant heterogeneity among firms in terms of how markets discount expected future returns. To explore this heterogeneity and better assess IDR as a measure of time horizons, we estimate the relationship of IDR with two categories of measures thought to proxy for firm time horizons. Specifically, we examine measures capturing: (a) a firm's behavior that signals its time orientation (e.g., long-term investments and management incentives); and (b) behavior of outside parties that signals the firm's time orientation, possibly via exerting pressure on the firm to demonstrate short-term performance (e.g., institutional investors, analysts, and activist shareholders).

With regard to firm behavior, we find that firms making more significant investments with arguably longer-term payoffs, in areas such as R&D and capital, have future cash flows that are discounted less than those firms investing less. In contrast, increasing share repurchases and dividends correlates with increased discounting, further corroborating the link between time horizons and our implied discount measure, since such spending is arguably a direct substitute for longer-term investments. Using random coefficient models (RCMs), we also find that these investment effects differ meaningfully between firms; for example, firms investing more in R&D have future cash flows that are discounted by the market less, but the correlation between implied discounting and R&D intensity varies significantly by firm. This raises important questions about why some firms are able to pursue longer-term and sometimes more uncertain returns, while others are penalized by investors for seemingly similar decisions. One explanation is that firms differ in their R&D productivity (Knott, 2008), so optimal R&D intensity differs across firms.

With regard to the behavior of outside parties, we find long-term ownership and short-term external pressures matter; firms held by more transient institutional owners (i.e., those that are characterized by shorter holding periods)[4] and in industries where shareholder activism is more likely have more discounted future cash flows. We also find more discounted future cash flows for firms when their share prices are relatively more responsive to earnings news (i.e., a high earnings response coefficient); greater price sensitivity to news likely reflects greater information asymmetry surrounding the firm's behavior and, thus, more significant uncertainty on the firm's longer-term returns. In contrast, long-term CEO compensation packages, indicators of long-term oriented management, are correlated with lower IDR.

Via extensive robustness checks on a wide range of issues that could either bias results or serve as alternative explanations (including endogeneity, specific model assumptions, and industry conditions), we demonstrate that the results we observe are largely consistent with expectations from earlier research on the firm-level indicators of time horizons. This supports our central thesis that the IDR is a meaningful proxy for firm time horizons.

This article proceeds as follows. We begin in Section 2 by describing the measure (i.e., IDR) that we use to capture firm time horizons and the data we use to estimate this measure. In Section 3, we discuss measure constructions and descriptive statistics that highlight market wide trends. Section 4 then delves into the relationship between the IDR and firm behavior and characteristics thought to correlate with firm time horizons. This analysis allows us to both explore firm heterogeneity in discounting as well as to evaluate IDR as a signal for firm time horizons. We conclude with a discussion of implications, limitations, and future directions in Section 5.

[4]These effects can be attributed to firms with short time horizons attracting investors with short-term preferences and/or investors pressuring firms to change their investment behavior. Our analysis below focuses on the first mechanism, leaving the evaluation of investor impact on firm behavior to future work.

Empirical robustness tests, as well as theoretically developed links of our implied discounting measure with both firm hurdle rates and time horizons, are set out in online appendices.

2 | IMPLIED DISCOUNT RATE (*IDR*) AS A PROXY FOR FIRM TIME HORIZONS

Obtaining evidence of whether firm time horizons are shifting and how these horizons vary across firms is challenging, given that direct measures of time preferences are not readily available. Further, existing research is spread across disciplines and typically takes a highly focused approach, examining relationships among a small set of variables that bear close links with theoretically derived mechanisms but that are too circumscribed to reveal market-wide phenomena. To obtain a firm level measure that can be estimated for most publicly listed firms and reveal both market-wide trends and firm heterogeneity, we adapt a measure first used for capturing market valuation horizons by Miles (1993) and later by Davies et al. (2014). Both studies use a variant of a capital asset pricing model (CAPM) to estimate a discount rate, x, applied by markets to a firm's expected future cash flows and unexplained by the firm-specific risk premium.

Conceptually, we are estimating a firm's current stock price as a function of its expected future dividends and stock price, discounted by the risk-free rate and the firm specific risk premium:

$$P_{jt} = \frac{E_t\left[D_{jt+1}\right]\boldsymbol{x_{jt}}}{\left(1+r_t+\pi_{jt}\right)} + \frac{E_t\left[D_{jt+2}\right]\boldsymbol{x_{jt}^2}}{\left(1+r_t+\pi_{jt}\right)^2} + \dots \frac{\left(E_t\left[D_{jt+N}\right] + E_t\left[P_{jt+N}\right]x_{jt}^N\right.}{\left(1+r_t+\pi_{jt}\right)^N} + \varepsilon \tag{1}$$

where P_{jt} is the stock price of firm j at time t, $E_t[D_{jt+1}]$ is the expected value of firm j's dividends in the next period, r_t is the market risk free rate, π_{jt} is the firm's risk premium, and N is the number of periods used in the estimation of the current period's stock price. The estimated parameter x_{jt} (hereafter referred to as x) measures the extent to which expected future cash flows are discounted by the market.

To facilitate more intuitive interpretation of the measure in our analyses below, we transform x as follows:

$$\mathrm{IDR} = 1 - x.$$

Larger values of IDR suggest greater discounting of a firm's future cash flows by the market, while smaller values imply lower discounting as compared to the benchmark CAPM estimates. To answer the central questions of this article, we examine whether IDR varies nonrandomly over time as well as whether (and how) IDR varies systematically across firms.[5] Before describing our estimation approach, however, we first evaluate the link between x (i.e., the foundation

[5]To the extent that the asset pricing model we use precisely values firms, the estimate of x based on the population should not be significantly different from one (or IDR should not be significantly different from zero) in a cross section or over time. Given the debate surrounding the precision of CAPM in estimating firm values, however, we do not attempt to make assertions about absolute values of x or IDR, instead focusing on changes over time and comparisons between firms in the cross section. See Fama and French (2008) and Shleifer and Vishny (1997) for discussions of the mixed empirical support and implications of limits to arbitrage for CAPM.

of IDR) and firm time horizons via an example and analytic exercise and briefly consider the implications of estimating a model that deviates from standard finance theory (i.e., via inclusion of x).

To illustrate how x and, by extension, IDR, translates into firm time horizons, consider the following example. Assume a firm can make one of three possible investments of equal cost but differing payoffs as set out in Figure 1. Using a weighted average cost of capital (WACC) of 9% for the firm, the NPV is calculated over the useful life of the investment (i.e., 10 years) and the projects ranked. Without the addition of x, the firm prefers investment A, which has both the highest NPV and cumulative cash flow. Investment C, with the lowest, but nearest term, payoffs, is ranked last. Adding x to the NPV calculation with a value of 0.95 (which translates to greater discounting of future cash flows), leads to a reversal of preference ordering of the investments. The near-term payoffs of investment C are the most preferred, even though these payoffs are the smallest cumulatively. In this sense, we think of additional discounting by the market as reflecting shorter time horizons within the firm; increased discounting translates directly into preference ordering for timing on investment payoffs.

We can also evaluate what x and IDR represent for a firm theoretically by restating x as a function of the internal firm hurdle rate (i.e., the rate of return used by a firm to evaluate its investments) and cost of capital, where increasing hurdle rates indicate shorter time horizons for payoffs. As shown in the Online Appendix A (Equation A7), x can be restated as: $x=\frac{1+C}{1+R}$, where C is the firm's cost of capital, determined by the risk-free rate and firm specific risk premium, and R is the firm's investment hurdle rate. The key assumption for this derivation is that a firm's stock price reflects the present value of the firm as an investment project. Note that x equals one (and IDR equals zero) when the firm's cost of capital is equivalent to the firm's internal hurdle rate, implying that there is no additional discounting by the market beyond the risk-free rate and firm specific risk premium. We discuss the fuller implications in Online Appendix A, but point out here that, as a firm's investment hurdle rate increases (i.e., R increases), x decreases, IDR increases and expected future cash flows are more heavily discounted. Thus, IDR represents the wedge between a firm's hurdle rates and its cost of capital. Conceptually, a higher hurdle rate relative to the cost of capital, which is consistent with firm strategies favoring short-term performance, is reflected in greater discounting of expected future payoffs, or lower x and thus higher IDR. In this sense, firm discounting and market discounting of expected future payoffs are tightly linked.

Note that the model we use to estimate x relaxes a key assumption in the finance literature: that discount rates applied by investors to generate stock prices reflect systematic firm risk and, thus, not time horizons per se. By including x in Equation (1) above, we relax this assumption and allow discount rates to be determined by factors beyond defined systematic firm risk. Empirical evidence supports this; the "anomalies" literature, including both the rational finance literature, such as Fama and French (2008), as well as the behavioral literature, such as Shleifer and Vishny (1997), rely on the empirical observation that actual stock pricing diverges from standard finance models based solely on systematic firm risk.[6]

Within the firm, discount rates also deviate from what finance models predict, namely that firm hurdle rates should match the firm's WACC. In practice, however, several studies show that firm hurdle rates used for investment decisions deviate from the cost of capital (e.g., Mankins et al., 2017; MAPI, 2016; Meier & Tarhan, 2007; Poterba & Summers, 1995).

[6]There are differences in assumptions underlying these two literatures as to why market pricing deviates from standard finance models, but it is sufficient for our purposes here that the deviation occurs empirically.

	A	B	C
Investment Cost	$60	$60	$60
Cash Flows	$28pa, years 6-10	$10pa, annually	$16pa, years 1-5
Cumulative CF	$140	$100	$80
NPV	$70.78	$64.18	$62.23
Ranking	**1**	**2**	**3**
NPV with x	$47.50	$50.70	$53.97
Ranking with x	**3**	**2**	**1**

WACC set at 9% for all NPV calculations and x is set to 0.95 in the last two rows. Note that $IDR = 1 - x$.

FIGURE 1 Illustration of the relationship between x and investment preferences

Across these studies, hurdle rates used by CEOs and CFOs significantly exceed the cost of capital, consistent with IDR being greater than zero.

Once we allow discount rates to deviate from systematic firm risk (for investors) and WACC (for firms), the discount rates used by investors and firms have implications for time horizons. A deeper discount rate applied by firms to investment decisions (i.e., one that exceeds the cost of capital) will lead the firm to prefer investments with more near term payoffs, as illustrated in Figure 1. This is not to imply that pricing is random or that investors and firms are irrational, but rather that there are unincluded factors in the pricing models that are relevant to determining preference ordering on investments. We do not rely solely on our arguments here, however, to evaluate whether IDR captures firm time horizons, but also estimate the relationship between IDR and previously used proxies for firm time horizons in extensive empirical analyses below (Section 4 and the appendices).

3 | ESTIMATING THE *IDR*

3.1 | Data, sample, and empirical approach

To estimate the IDR, our proxy for firm time horizons, we use all public firms listed on major U.S. stock exchanges (NYSE/AMEX and NASDAQ) over 1980–2013, excluding over-the-counter stocks. We choose 1980 for the start of our study since several important variables were not available until the late 1970s.[7] We combine this security data with several firm-level datasets to construct variables of interest set out in Table 1 and discussed below.

Equation (1) above is a dividend capitalization model (e.g., Easton, 2007), whereby a firm's stock price is assumed to be equal to the discounted value of its future dividends and terminal stock price, with the addition of the discount term, x.[8] To empirically estimate this model, we

[7]To account for confounding effects of newness of a listing and major changes in a security, we further exclude public firms that have been listed on the stock exchange for fewer than 5 years and those which have undergone significant changes in the prior 5 years. These changes are events that trigger a change in CUSIP identifier, which include name change, (reverse) stock split, and restructuring (FINRA, 2016). We also drop outlier cases where stock price is higher than 1,000. Such cases represent approximately 0.05% of the whole sample.

[8]The terminal stock price is the price at the end of the time horizon, which in our case is set to the standard 5-year window.

use current dividends and the current stock price to proxy for the current expectation of future dividends and stock price.[9] Further, we follow Miles (1993) and substitute the following expression for the firm's risk premium:

$$\pi_{jt} = \alpha_1 \beta_{jt} + \alpha_2 Z_{jt} \tag{2}$$

Two well-established, risk-related factors are used to estimate a firm-specific risk premium in Equation (2). β_{jt} is firm j's beta in year t, which measures the volatility of firm j's stock price compared with the market, and Z_{jt} is firm j's gearing (i.e., debt/equity), which measures the firm's risk associated with financial leverage.[10] We obtain the company beta from CRSP, which calculates annual betas for public companies using the methods set out in Scholes and Williams (1977). A firm's debt and equity are obtained from COMPUSTAT. α_1, and α_2 are coefficients associated with the firm specific risk factors and are estimated by the model below.

Substituting the proxies and Equation (2) into Equation (1), we obtain the following equation for nonlinear empirical estimation:

$$P_{j0} = \frac{(D_{j0})\boldsymbol{x_{j0}}}{\left(1+r_0+\alpha_1\beta_{j0}+\alpha_2 Z_{j0}\right)} + \frac{(D_{j0})\boldsymbol{x_{j0}^2}}{\left(1+r_0+\alpha_1\beta_{j0}+\alpha_2 Z_{j0}\right)^2} + \ldots \frac{(D_{j0}+P_{j0})\boldsymbol{x_{j0}^N}}{\left(1+r_0+\alpha_1\beta_{j0}+\alpha_2 Z_{j0}\right)^N} + \varepsilon \tag{3}$$

where at time 0, P_{j0} is the stock price of firm j, D_{j0} is firm dividends, r_0 is the risk-free rate, and β_{j0} and Z_{j0} are the firm's beta and gearing, respectively. We set N equal to 5, so use five periods of future expected dividends and the expected stock price in year 5 to estimate P_{j0}.[11] The annual average yield to maturity of a 1-year government bond (averaged over daily quotes) is our risk-free rate. The parameters α_1, α_2, and x_{j0} are simultaneously estimated by the model and x_{j0} captures the extent to which the actual discount rate of expected future cash flows in the stock price deviates from the theoretical rate predicted by the CAPM.[12]

Both Miles (1993) and Davies et al. (2014) use market and industry level estimates of x to argue that, for many industries in the United Kingdom and some in the United States, markets are more heavily discounting future cash flows now than in years past. While informative, these

[9]Using current values of prices and dividends per share as instruments gives consistent parameter estimates provided that the extent to which future prices and dividends, "deviate from expected values over and above the average degree of over (or under) stock market performance do not depend on past performance," (Miles, 1993, p. 1386). To the extent that current prices (dividends) are a noisy measure of future prices (dividends), such noise adds to measurement error, making our estimates more conservative. Any such noise is assumed to be unsystematic; any systematic under or overestimation of future price (dividend) by current price (dividend) should be transient and arbitraged away. Note, however, that we also estimate a measure based on analyst forecasted earnings, which does not rely on expected dividends.

[10]In our robustness appendices, we take up alternative specifications of this formula, including the addition of additional factors from Fama and French (1992). We also estimate x with the addition of share repurchases to expected dividends as a source of cash flows. Results reflect those reported in the paper below and are described in Online Appendix C.

[11]Brochet, Loumioti, and Seraphim (2014) find that there is a negative and significant relationship between firm short termism (measured via earnings conference call transcripts) and both stock returns and accounting performance that holds for 1–5 years in the future. We have also estimated Equation (3) using a 3- or 7-year window, obtaining similar patterns to those reported below.

[12]As robustness checks, we reestimate x with different specifications as well as different samples. More precisely, we reestimate Equation (3) above with an intercept term, which allows some heterogeneity to load on terms other than x, α_1, and α_2. While not shown here, overall trends (as shown in Figure 2) exhibit highly consistent patterns to those exhibited here.

TABLE 1 Variable construction, expected signs, and data sources

Variable	Expected sign[a]	Construction	Source
Firm investment			
R&D intensity	–	R&D spending scaled by total firm assets in a given year	COMPUSTAT
Advertising intensity	−/+	Advertising spending scaled by total firm assets	COMPUSTAT
Capital expenditure	–	Ratio of capital spending to total assets	COMPUSTAT
Share repurchase	+	Log difference between the current and previous year's treasury stock. A firm's treasury stock is shares that it holds in itself, held either by repurchase/buyback or because the stock had not been issued to the public. Where treasury stock is missing, we use the difference between purchase and sales of common stock in the current year instead. Negative and missing values are set to zero.	COMPUSTAT
Dividends	+	Log (total dividends issued in the current year +1)	COMPUSTAT
Institutional ownership			
Transient	+	Percentage of shares owned by transient institutional investors in the focal firm (i.e., number of shares held by institution type divided by total shares outstanding each year). Transient investors are institutions with high portfolio turnover and highly diversified holdings.[c]	Thomson Reuters Institutional (13F) Holdings matched to the classification in Bushee (2001)[b]
Dedicated	–	Percentage of shares owned by dedicated institutional investors in the focal firm (i.e., number of shares held by institution type divided by total shares outstanding each year). Dedicated investors are institutions with low portfolio turnover and concentrated holdings.	As above
Quasi-indexer	NA	Percentage of shares owned by quasi-indexer institutional investors in the focal firm (i.e., number of shares held by institution type divided by total shares outstanding each year). Quasi-indexer investors are institutions that are widely diversified, but with lower turnover relative to transient investors.	As above

TABLE 1 (Continued)

Variable	Expected sign[a]	Construction	Source
Unknown category	NA	Percentage of shares owned by uncategorized institutional investors in the focal firm (i.e., number of shares held by institution type divided by total shares outstanding each year). Uncategorized investors are institutions that tend to be dedicated investors but have few holdings and insufficient information to categorize (per discussions with Brian Bushee, March, 2016).	As above
Financial health			
Financial slack	–	The difference between current assets and current liabilities, divided by total firm assets	COMPUSTAT
Sales growth	–	Firm sales in the current period, less sales in the prior period, scaled by total sales in the prior period. We winsorize Sales Growth at the 1st and 99th percentile but note that this does not affect estimates of other variables.	COMPUSTAT
Firm age	+	Count of years since the firm was listed on a public exchange (or 1980, whichever is later)	COMPUSTAT
Management incentives			
LTIP - CEO	–	CEO compensation in the form of restricted stock grants, new stock options and other long-term incentive plan payoffs, normalized by total compensation. Total compensation is the total of current compensation and other compensation.	Standard & Poor's ExecuComp, available for S&P 1500 firms from 1992–2006 only
CEO turnover	+	Number of unique CEOs from IPO (or 1992, when the CEO data become available, whichever is later) to the observation year, divided by the years since IPO (or 1992, whichever is later)	Standard and Poor's ExecuComp and COMPUSTAT
External pressure			
Analyst coverage	+	Log (number of analysts covering a firm +1)	IBES from Thomson Financial

TABLE 1 (Continued)

Variable	Expected sign[a]	Construction	Source
ERC	+	ERC is estimated by regressing: $CAR_i = \beta_0 + \beta_1 UE_i + \varepsilon_i$ Where CAR_i is the cumulative abnormal return for firm i (i.e., firm return less market return) on the day of the quarterly earnings announcement (Ball & Brown, 1968). UE_i is the firm's unexpected quarterly earnings per share deflated by the share price at the beginning of the quarter. Unexpected quarterly earnings per share are the difference between actual earnings announced and expected earnings, captured via quarterly earnings per share 1 year earlier. The regression is run for each firm's quarterly earnings announcements for 3 years (i.e., 12 quarters) to estimate β_1, the firm's ERC. Since we expect that market pressures operate on firms irrespective of the direction of the market response to unexpected earnings announcements, we take the absolute value of ERC for our regressions.	CRSP
Activism threat	+	Number of activist filings in an industry (3 digit NAICS), normalized by the number of public firms in that industry in a year. Activist filings include any of eight types of SEC filings by shareholders, including contested solicitations and proxy contests. We follow Norli, Ostergaard, and Schindele (2015) and include filings of the following SEC forms: PREC14A, PREN14A, PRRN14A, DEFC14A, DEFN14A, DFRN14A, DFAN14A, and DEFC14C.	SEC filings on WRDS (SEC Analytics Suite), available from 1994 onward

[a]Negative signs imply lengthening time horizons (i.e., lower IDR), while positive signs imply contracting time horizons (i.e., greater IDR).
[b]We drop observations where a firm's ownership among all types adds to more than 100% in a year.
[c]Classification data taken from: http://acct.wharton.upenn.edu/faculty/bushee/IIclass.html. Bushee (2001) changes the classification scheme from his 1998 paper, dropping momentum trading from the classification scheme. In our analysis below, we use the ERC as a partial control for the extent of momentum trading in the focal firm.

earlier analyses do not examine whether some firms are discounted more or less than others within the same time period and industry and, if so, why. To estimate x at the firm level, we use a nonlinear random coefficient model (RCM). Conceptually, RCMs offer flexible parameter estimates that incorporate both the baseline of the whole population, thus taking advantage of the information contained in the entire sample of firms, and the variance of the specific firm. Estimates that vary across firms are computed from this information and provide insight as to whether discount rates (represented by x) are firm-specific and time-varying. This is an important point of departure from earlier work, allowing for further insights into the implications of firm strategy for time horizons.

To estimate time varying, firm specific coefficients of x, we group firm-year observations by a 5-year rolling window, since multiple years of data are required per firm to obtain firm specific estimates.[13] For example, for firm j in year t, the estimation of x_{jt} is based on the observations of firm j in year t-4 to year t. We choose a 5-year window since previous simulation work reveals that five observations per firm yields estimates that are accurate (i.e., the true firm-specific estimate falls within the 95% confidence interval) more than 94% of the time in RCMs with samples that have 100 firms or greater (Alcácer, Chung, Hawk, & Pacheco-de-Almeida, 2018, p. 549).[14] Theoretically, if our estimated x is less than one and thus IDR exceeds zero, it indicates that the market is discounting expected future cash flows of firm j at a steeper rate than the sum of the risk-free rate and estimated firm-specific risk premium. In other words, higher values of IDR suggest shorter time horizons. However, as mentioned above, we place less weight on the absolute values of IDR and instead focus on changes over time and comparisons across firms in the cross section. Systematic differences between firms capture variance in shareholder expectations around a firm's future prospects and, we argue, reflect a firm's time horizons.

3.2 | *IDR* trends from 1980 to 2013

Average implied discount estimates over time, along with estimates at the 5th and 95th percentiles and the number of sample firms are set out in Figure 2.

Figure 2 shows IDR increasing over time, despite fluctuations. All means shown in Figure 2 are statistically different from zero with a p-value of .001 or less. In early time windows, there is little evidence of systemic short termism; values of IDR are negative. An increase in the IDR occurs around the dot-com bubble (i.e., 1999–2000) as well as the financial crisis (2007–2008). To put these trends in perspective, assuming consistent cash flows, the estimated IDR over a 5-year return period has risen 20.66% over the last three decades. Given the same profile of risk factors and cash flows, a stock would be priced 17.38% lower in the most recent sampling period compared to the earliest one due to the higher discounting rate applied.

This trend is broadly consistent with results previously shown at the industry level in other samples (i.e., Davies et al., 2014; Miles, 1993), demonstrating that increasing discounting has not only occurred around the time when management scholars started to systematically examine the short-termism phenomenon (Laverty, 1996; Porter, 1992), but also persisted in the 10 years beyond the most recent sample considered by Davies et al. (2014).[15] Further, IDR

[13]While it is possible to estimate the model with quarterly data, we use annual data to reduce the noise from dividend frequency, since some firms do not pay dividends every quarter and seasonal fluctuations may confound the analysis.
[14]The IDR estimated from 7 years of observations is highly correlated with our main measure.
[15]Consistent with Davies et al. (2014), we also find a similar declining trend of x over 1985–2004 in our sample.

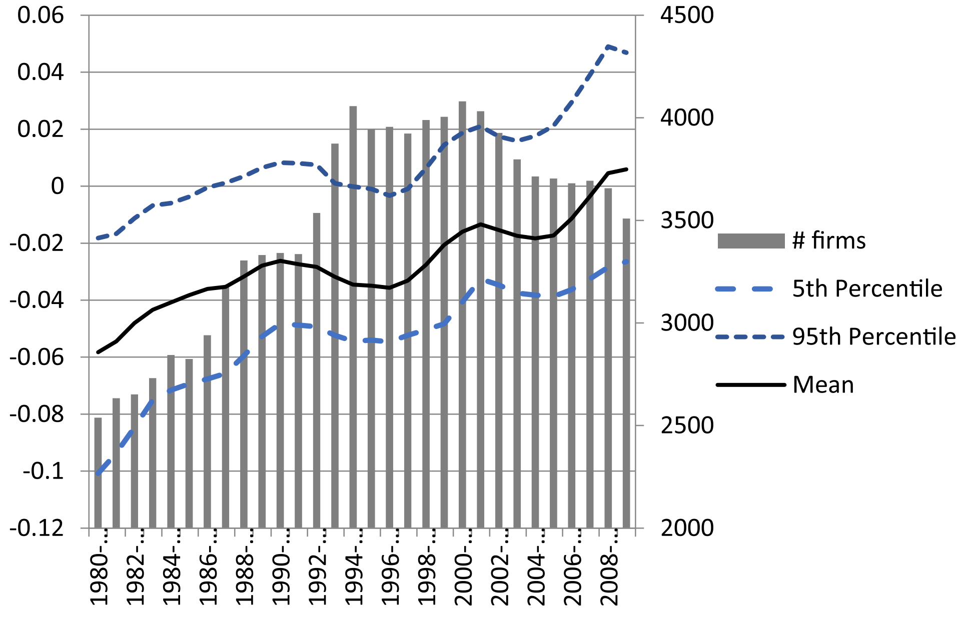


FIGURE 2 Implied discount rate (IDR), mean values 1980–2013. Average, 5th percentile and 95th percentile IDR (i.e., 1-*x*) for firms, with number of sample firms shown in histogram

moves in expected ways following various unexpected economy-wide shocks; both the 1999–2000 dot-com bubble and the 2007–2009 financial crisis mark sharp upticks in IDR that likely reflect the increased market uncertainty following these events. In contrast, IDR appears to take a downward turn around 2004; Google announcing in 2004 that it would not give earnings guidance in order to take a long-term focus, with many other firms following suit, is one possible explanation.[16]

Note that, while there is both significant industry variance and firm variance within industry on mean values of IDR, the increasing trend is largely consistent across industries. Online Appendix B graphs IDR over time, split by industry (here, two-digit NAICS codes), followed by similar graphs of IDR mean values, overlaid by the range of firm estimates within industry. All industries reveal a positive IDR (i.e., increased discounting) at the end of the period. The firm heterogeneity within industry revealed in the second set of graphs demonstrates the value of generating firm specific estimates.

These trends suggest that investors are discounting firms listed on U.S. exchanges increasingly over time. However, they do not address whether this effect is due to the changing composition of firms on these exchanges or, alternatively, due to the average being pulled by a few firms that are more strongly discounted. To examine these questions, we graph the intra-firm movement in IDR over three comparison periods in Figure 3. To remove any trends that may

[16]While required earnings reporting frequency has not changed since 1970 in the United States, the choice to offer earnings guidance may impact firm time horizons that are reflected by the market. Google's announcement, via the "Letter from the Founders" in Google's Form S-1, is contemporaneous with a broader market trend around the same time to cease earnings guidance (see, e.g., https://www.sec.gov/Archives/edgar/data/1288776/000119312504073639/ds1.htm#toc16167_1, The Economist (2006), April 27; Hsieh, Koller, & Rajan, 2006).

be driven by a small set of influential outliers, we exclude the top 5% and bottom 5% of firms in terms of IDR within a given time period.

IDR is represented for the earlier of the two comparison periods on the horizontal axis and for the later period on the vertical. Each mark represents a single firm, capturing how IDR has changed over time for that firm between two periods. Any marks above the 45° line reveal individual firms that are more discounted over time, with marks below the line revealing the opposite. Two key observations emerge from this graph. First, the bulk of the marks are above the diagonal, providing evidence that firms are being discounted more over time and that our earlier observations cannot be attributed to changing composition of firms on the markets or by a few highly discounted firms pulling the average. Second, the three sequential comparison periods moving up the diagonal illustrate that, overall, IDR has increased not only within firms but also with each successive period. For example, while firms in the most recent cohort (i.e., 2004–2008 vs. 2009–2013) are more discounted in 2009–2013 than in 2004–2008, these firms are also more discounted than those firms in earlier cohorts (e.g., the cohort of 1984–1988 vs. 1989–1993).[17]

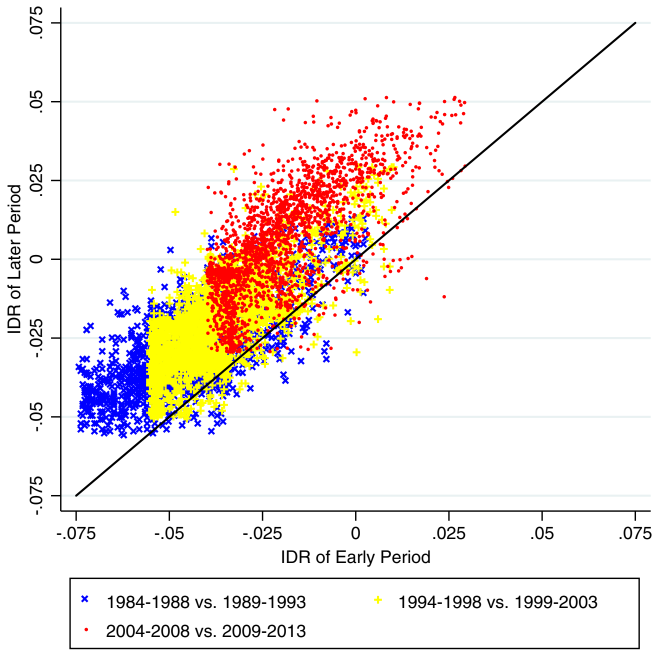
That IDR is significantly different from zero and that there is a positive time trend point to "mispricing" or an "anomaly" according to finance literature. Both rational and behavioral explanations are possible, implying either omitted risk factors relevant to the standard asset pricing model (i.e., Fama & French, 2008) or behavioral patterns that violate standard finance assumptions. These violations include preference inconsistency (e.g., Loewenstein & Thaler, 1989) or myopic loss aversion (e.g., Benartzi & Thaler, 1995) along with limits to arbitrage that leave any mispricing uncorrected in the market (e.g., Shleifer & Vishny, 1997). While full exploration of the sources of our observed trends is beyond the scope of the paper, it is possible that rising uncertainty over technology change, globalization exposure and other market-wide shifts point to less optimism for long-term returns, shortened investment cycles and, we conjecture, rising impatience around investment payoffs. This makes pricing of long-term investments more difficult and may increase the risk associated with such investments (and, consequently, IDR). Increased uncertainty may also heighten myopic loss aversion, where individuals are more sensitive to losses than gains and will not hold long-term assets if evaluation periods are frequent (e.g., Benartzi & Thaler, 1995).[18] Put differently, firms may be unwilling to invest in long-term assets if they evaluate investment performance frequently, leading to a preference for short over long-term returns and a consequent reflection in share prices.[19]

[17]We conduct additional robustness checks around changing composition of firms, including replotting Figure 2 using an unchanging group of firms over time, and find the same upward trend in IDR, as noted in Online Appendix C.

[18]An evaluation period is the length of time over which an investor aggregates returns. If an investor (a firm in our case) evaluates returns over a 1-year period, even if the true planning horizon is 30 years, the investor behaves as if the planning horizon is 1 year. This collapse of the planning time horizon to the evaluation period has been shown in a variety of theoretical, experimental and empirical work in the behavioral economics and finance literatures (see, e.g., Benartzi & Thaler, 1995; Gneezy & Potters, 1997; Thaler, Tversky, Kahneman, & Schwartz, 1997; Benartzi & Thaler, 1999; Gneezy, Kapteyn, & Potters, 2003; Haigh & List, 2005; Fellner & Sutter, 2009).

[19]The standard counter to the above logic is that the market will correct any inefficient mispricing through arbitrage. The rational finance models assume that the prices are, in fact, efficient, including all relevant risk information, even if not yet discovered by the standard finance models. In this sense, rational models assume that any necessary arbitrage is occurring, and prices are constantly being corrected. Behavioral models, however, acknowledge that prices may be inefficient (e.g., not reflecting relevant information about long-term value) such that investors are making irrational decisions from an economic standpoint. Thus, behavioral models require a second assumption that there are limits to arbitrage, as set out by Shleifer and Vishny (1997), else any such mispricing from behavioral biases would be automatically corrected by investors (assuming that arbitraging investors do not hold the same behavioral bias).

FIGURE 3 Within firm movement of implied discount rate (IDR)



Our empirical analyses in Section 4 explore the firm correlates with IDR, helping to inform the source of the mispricing we observe. In these analyses, we evaluate systematic, firm-level drivers of IDR by examining correlations with firm specific variables that proxy for time horizons and undertaking robustness checks to rule out other explanations for rising IDR. Before exploring these potential patterns, however, we directly address several potential critiques of the model used to estimate IDR.

The first concern is the sensitivity of our results to inclusion of dividend-issuing firms, as in Miles (1993) and Davies et al. (2014). We take several approaches to evaluate this concern as well as how to interpret IDR for firms that do not issue dividends. These details are set out in Online Appendix C, but we note that our robustness checks yield substantively similar results to those reported here, even when removing firms that do not issue dividends and when expanding the definition of cash flows to include stock repurchases as well as dividends.[20] This is true both for our reported trends in this section as well as the analysis examining the correlates with IDR, suggesting that our findings are unlikely to be an artifact of dividend-based models.

We also estimate two alternative measures of IDR: (a) an adaptation of our existing model to include additional factors relevant to firm valuation, as identified by Fama and French (1992); and (b) an entirely different valuation model based on residual income calculated from analyst earnings forecasts (Abarbanell & Bernard, 2000; Gebhardt, Lee, & Swaminathan, 2001). The first approach addresses whether the trend we observe can be attributed to other sources of risk that are not included in Equation (3), while the second proxies for expected cash flows via analyst earnings forecasts. Estimation details and graphs for these alternatives are set out in Online Appendix D. The graphs reveal very similar time trends between our original model based on Equation (3) and modifications that include either additional Fama–French factors or an estimate based on analyst expectations. Thus, IDR, whether employing alternate specifications or

[20]We thank an anonymous reviewer for this suggestion.

entirely different sources of information on future firm expectations, shows an unambiguous, overall increase from 1980 to 2013.

Overall, the above descriptive statistics display the broad trend that markets are increasingly discounting the future dividends and stock prices of firms. While these details reveal the market level phenomenon (i.e., trend changes over time), they do not directly answer whether and how IDR is linked to firm behavior. We expect that how individual firms are discounted by the market reflect past firm behavior, time preferences, and broad market factors, such as changes in market-wide uncertainty. To explore whether there are systematic differences between firms in IDR, we now estimate correlations with firm specific variables that proxy for firm time horizons as well as those that suggest alternative explanations (unrelated to time horizons) for observed differences in IDR both between firms and over time. We also use these analyses to evaluate the extent to which IDR captures firm time horizons.

4 | EXPLORING AND EXPLAINING TIME HORIZON HETEROGENEITY BETWEEN FIRMS

4.1 | Signals of firm time horizons from literature

We next investigate the relationship between IDR and five categories of variables that are related to firm time horizons: firm investment, institutional ownership, financial health, management incentives, and external pressures. Our general premise is that by examining correlations of these firm level variables with IDR, we can assess the extent to which IDR captures firm time horizons as well as reveal the characteristics of firms that have shorter (longer) time horizons. We also explore the relationship between IDR and the behavior of outside parties (i.e., investors and analysts) that signal the firm's time horizon and that may also exert influence on firms to demonstrate short-term performance.[21]

All variable constructions, data sources, and expected signs from prior literature are set out in Table 1. A negative expected sign indicates our prior that the variable is correlated with lower IDR (i.e., relatively longer time horizons). To the extent that correlations are as expected and statistically different from zero, they suggest that firm time horizons are reflected in IDR. Table 2 contains descriptive statistics for all measures. Before describing our empirical analysis, we briefly discuss the literature that drives our priors on these variables.

Our firm investment measures capture a combination of investments that are characterized by long-term payoffs, including durable goods as well as intangibles, such as R&D and branding. Flammer and Bansal (2017) find that firms are more likely to pursue investments with longer-term payoffs, such as R&D, when the firm has a longer-term orientation, proxied via adoption of long-term CEO compensation packages. This is consistent with earlier research; managers increase capital investments after firms adopt long-term compensation schemes (Larcker, 1983). DesJardine (2015) similarly finds that firms make greater investments in durable assets when they are better able to take a longer-term perspective, in that analysis captured via loss of analyst coverage.

[21]We do not explore this potentially causal relationship between outside parties and firm time horizons here, maintaining our current focus on identifying correlates from prior literature that form empirical signals of a firm's time horizons. We leave exploration of whether and how outside parties influence a firm's time horizons to future work.

We also include a measure of whether firms offer a short-term return of cash to shareholders via share repurchase and dividend programs. A firm may decide to return cash to shareholders when it has few good long-term investment prospects. However, firms also use these programs to boost stock prices in the short term, which may come at the expense of investments and jobs in the longer term (Almeida, Fos, & Kronlund, 2016).[22]

Measures to capture a firm's financial health and maturity are included, since they capture the firm's future prospects and, consequently, should be reflected in market expectations. Financial slack, for instance, captures whether the firm faces financing constraints that affect its ability undertake longer-term investments and buffer against unforeseen adversity. Using investments with distinctly different payback periods for cable television operators, Souder and Shaver (2010) find that firms with greater financial slack are more likely to make long-term investments. To the extent that past sales growth is a reasonable predictor of future firm growth, our sales growth measure controls for speculation on future prospects that may be embedded in implied discounting. Recognizing that more mature firms may experience lower growth rates, which would be reflected in diminished market expectations (and higher discounting), we also include a measure of firm age.

Another relevant proxy for manager (and thus firm) time orientation is management incentives. Mizik (2010) and Kothari (2001) show that the more CEO compensation is tied to short-term performance metrics, the more earnings will be managed, typically via cuts to longer-term investments like R&D, since negative earnings "surprises" lead to significant stock devaluations. The performance metrics that compensation is most commonly tied to are earnings or total shareholder return in the near term (Bettis, Bizjak, Coles, & Kalpathy, 2018). Our measure of compensation, long-term incentive plans LTIP) for CEOs captures how well incentives of top managers are aligned with the long-term performance of the firm, typically considered as 3 years (e.g., Aggarwal, 2008; Flammer & Bansal, 2017). We also include a measure of a firm's CEO turnover, since some prior research shows that shorter CEO tenure creates incentives for CEOs to engage in short-term behaviors, such as earnings manipulation (e.g., Kaplan & Minton, 2012). Others suggest that long tenure may lead to cognitive rigidity and performance decline (Hambrick & Fukutomi, 1991), which may induce short-term behavior.

Beyond firm characteristics, the behavior of institutions that own a firm's shares have been shown to reflect the firm's time horizon. Institutional ownership variables capture the extent to which these owners have long-term horizons, which has implications for the behavior and time horizons of the firms that they own. For example, a firm with more stable investors may reflect the firm's longer-term perspective and, thus, have future cash flows that are less discounted by the market. When a firm's institutional owners hold shares for a longer period of time, the firm maintains R&D even in the face of earnings pressure (Bushee, 1998).[23] These effects may reinforce firm behavior, since once low turnover institutional investors are in place, Aghion, Van Reenen, and Zingales (2013) argue they reduce career concerns for managers, facilitating further investment (and subsequent productivity) in uncertain projects like R&D. High turnover institutional investors, on the other hand, invest in firms that have greater short-term earnings

[22]Additionally, we include dividends in our regressions below because they are a key element in the estimation of IDR. For this reason, if dividends are omitted as a right-hand side variable in regressions examining correlates with IDR, one might argue that failure to control for dividend policy will bias coefficients on the other variables. We note that our results reported in Tables 3 and 4 are robust to exclusion of dividend policy, however.

[23]For a more recent example in the context of airline pricing, see Zhang and Gimeno (2016).

TABLE 2 Descriptive statistics

Variable	*N*	Mean	Median	*SD*	Min	Max
Dependent variable						
Implied discount rate (IDR)	71,676	−0.0278	−0.0322	0.0263	−0.1175	0.6493
Firm investment						
R&D intensity	71,676	0.0466	0.0000	0.1290	−0.0039	11.1647
Advertising intensity	71,676	0.0144	0.0000	0.0475	0.0000	1.6603
Capital expenditure	71,676	0.0692	0.0482	0.0737	−0.0321	1.4631
Share repurchase	71,676	0.3991	0.0000	1.2093	0.0000	10.4464
Dividends	71,676	1.1935	0.0000	1.8221	−1.3243	10.5178
Institutional ownership						
Transient	71,676	0.0719	0.0156	0.1093	0.0000	0.9264
Dedicated	71,676	0.0451	0.0002	0.0784	0.0000	0.8295
Quasi-indexer	71,676	0.1379	0.0544	0.1780	0.0000	0.8838
Unknown category	71,676	0.0105	0.0000	0.0272	0.0000	0.7257
Financial health						
Financial slack	71,676	0.2774	0.2631	0.2610	−3.9595	1.0000
Sales growth	71,676	0.2616	0.1047	0.8245	−0.9879	7.1644
Firm age	71,676	10.0785	8.0000	6.7989	2.0000	30.0000
Management incentives						
LTIP - CEO	11,512	0.0956	0.0000	0.4994	0.0000	31.2767
CEO turnover	11,512	0.2506	0.2000	0.1687	0.0667	1.0000
External pressure						
Analyst coverage	24,346	1.4979	0.6931	1.7783	0.0000	6.7991
Earnings response coefficient (ERC)	24,346	2.1825	0.8672	4.4008	0.0000	151.8398
Activism threat	24,346	0.0324	0.0018	0.0852	0.0000	2.1111

(Bushee, 2001). We follow Bushee (2001), who develops a comprehensive method to classify institutional owners based on their portfolio turnover and diversification.

We also include three measures of external pressures from prior literature that may reflect or induce a firm's short-term orientation, via encouraging the firm to focus on short over long-term returns (e.g., via earnings management). Analyst coverage increases visibility of whether a firm conforms to market expectations and thus may pressure firms to focus on or reflect firm short-term goals (DesJardine, 2015; Graham et al., 2005). Pressure to meet analysts' presumed preferences for short-term investments or those with more certain payoffs is the hypothesized reason for why analyst coverage may shape firm preferences around time horizons (e.g., Benner, 2010). Note, however, that Barth, Kasznik, and McNichols (2001) find that analyst coverage is positively correlated with R&D spending.[24] The earnings response coefficient (ERC), proposed by Ball and Brown (1968), also captures market pressure in the form of price

[24]We take up this apparent inconsistency in our discussion of results in Section 4.2.

volatility around earnings announcements, which has been argued to lead firms to respond to short-term expectations and invest less overall (Asker, Farre-Mensa, & Ljungqvist, 2015).

Finally, the threat of shareholder activism has been shown to lead firms to focus on short-term returns (Fos, 2017; Qi, 2015). Given that a common objective of activists is to increase stock prices in the near term, this often leads to cost cutting and divestitures that grow stock prices in the short-term at the expense of longer-term investment and revenue growth (see, e.g., Bratton, 2010). Stock price returns, cash payouts to shareholders, operating performance, and CEO turnover increase in the two years following hedge fund activism; these shorter-term effects are consistent with the observed median holding period by hedge funds of 22 months (Brav, Jiang, Partnoy, & Thomas, 2008).[25] Shareholder activism is relatively rare, however, occurring in only 0.8% of U.S. listed firms in any year (Norli et al., 2015), but the threat of activism impacts a larger number of firms. Fos (2017) shows that, when the likelihood of shareholder activism increases (i.e., the threat of a proxy contest), firms change their behavior, increasing leverage, dividend and share repurchases while decreasing cash reserves as well as investment in R&D and capital. Firm performance appears to be affected as a result; Qi (2015) finds that an increasing shareholder activism threat dampens firm innovative outcomes. Whether activists become engaged because a firm is underperforming or because activists are seeking a short-term payoff, the threat of activism strongly points to firm preferences for short-term payoffs.

4.2 | Empirical results: How and why firms vary on *IDR*

To examine the validity of IDR as a proxy for firm time horizons as well as to better understand the sources of heterogeneity between firms in IDR, we estimate IDR as a function of firm level factors, both internal and external. We run both fixed effect models and RCMs, where the firm investment variables and intercept are "free" parameters that vary across firms (i.e., firm specific betas are estimated for these variables in addition to the full sample mean betas).[26]

For the RCM, we free parameter estimates on variables where we expect the market to have heterogeneous responses across firms. Specifically, we expect that the market will respond differently to firm investment decisions, depending on the firm's recent history, track record with past such investments and other contingencies not specified in the model. Thus, for our RCM regressions in Tables 3 and 4 reported, we free the coefficients estimated on firm investment variables: *R&D intensity*, *Advertising intensity*, *Capital expenditure*, *Share repurchase*, and *Dividends*.

[25]While news reports suggest a largely negative impact of activism on firm performance, research on these impacts is more equivocal and depends on both the measure of performance used as well as the time horizon considered. There is a large body of research on the impact of activists on firm performance that is beyond the scope of this paper to review, including Brav, Jiang, and Kim (2015) and Greenwood and Schor (2009). Recently, deHaan, Larcker, and McClure (2019) demonstrated that findings of positive, long-term effects of activism on performance are driven by the smallest 20 % of firms and that the remaining 80 % of firms experience insignificant performance effects from shareholder activism.

[26]RCMs have greater flexibility in modeling variance in response to firm-specific investment strategies, which is an effective way to deal with unobserved firm heterogeneity (Alcácer et al., 2018; Knott, 2008). For example, two firms with the same level of R&D intensity might face different levels of discounting due to differences in the nature of their R&D projects. RCMs allow us to capture both the mean and variance of the relationship of R&D intensity with IDR across firms.

Note that we have also estimated the regression constant as a free parameter in the RCM. With a free constant, the RCM has the advantage of both controlling for time invariant firm unobservables as well as allowing the relationship between dependent and independent variables to differ by firm (i.e., both the intercept and the slope can vary by firm).[27] While the RCM is less restrictive than fixed effects models in this sense, we still include fixed effect models in our Tables 3 and 4 as a reference benchmark and to alleviate concerns that our findings are dependent on RCM assumptions.

Note that IDR is captured from $t + 1$ to $t + 5$, while independent variables (set out in Table 1) are captured in period t to establish temporal precedence. An exception to this is *Sales growth*, which is measured in the 2 years prior to IDR (i.e., t and t-1). Nonoverlapping time-period dummies are included for all specifications and are based on the range of the dependent variable calculation. Results for the first three groups of variables—firm investment, institutional ownership, and financial health—are set out in Table 3.

Columns (1), (3), and (5) report fixed effect estimations, while Columns (2), (4), and (6) report RCM estimations. Note that all "a" columns for RCMs report mean betas for the sample, while the "b" columns report the estimated *SD* on these betas. A significant *SD* indicates that the marginal effects of an independent variable on the dependent variable differ meaningfully between firms.

Firm investment variables are correlated in expected ways with IDR. In the three fixed effects models, *R&D intensity* is not significantly different from zero. However, in all three RCM estimations, *R&D intensity* is negatively correlated with IDR, has a value significantly different from zero ($p = .000$), and the 95% confidence interval does not include zero. Further, the *SD* on *R&D intensity* is significant, suggesting that the same level of R&D spending is viewed differently by investors depending upon the firm. This idea is consistent with the notion of "organizational IQ" espoused by Knott (2008), who finds that returns to R&D differ between firms. Markets may also perceive differences in these returns and, thus, value R&D investments differently between firms.[28] This effect is precisely the reason to use the RCM; the significant negative relationship between *R&D intensity* and IDR is obscured in fixed effect models.[29]

A similar finding exists for *Advertising intensity*; fixed effect models show a null effect, while two of the three RCM estimates reveal a significantly negative, but heterogeneous, relationship with IDR (e.g., $p = .002$ in [2a]). The negative mean effect suggests that firms that advertise more are discounted less by the market. From the highly significant *SD*, it appears that the marginal effect of increased advertising spending is much more important for some firms than others.

[27]Allowing the intercept to vary across firms as a "free" parameter in RCMs controls for the potential between-firm baseline differences in IDR. In this sense, the free intercept is a "quasi-fixed effect," which follows a specific distributional form, while the traditional firm fixed effect can follow any distributional pattern. In practice, this means that any firm "quasi-fixed" effects that are further from the mean of the distribution are estimated via a shrinkage estimator to make them consistent with the distribution. See Alcácer et al. (2018) for more details.
[28]See, for example, Knott (2019) and Knott and Vieregger (2019).
[29]When the coefficient estimated via the fixed effect model is not significantly different from zero, but both the mean and variance are significant under the RCM, this suggests that there are firms at both tails of the distribution with significant relationships between *R&D Intensity* and IDR. When there is such underlying heterogeneity between firms in the relationship between the dependent and independent variable, FE models are misspecified. The consequences of this misspecification are biased results and potentially spurious significance regarding the joint significance of the firm fixed effects (Alcácer et al., 2018). The varied approaches in how firm heterogeneity is treated likely explain the difference in coefficient significance that we observe between the FE and RCM in some cases.

TABLE 3 Explaining IDR: Firm investment, ownership, and financial health

	FE	RCM		FE	RCM		FE	RCM	
		Beta	***SD***		**Beta**	***SD***		**Beta**	***SD***
DV = IDR	**(1)**	**(2a)**	**(2b)**	**(3)**	**(4a)**	**(4b)**	**(5)**	**(6a)**	**(6b)**
Firm investment									
R&D intensity	0.00002	−0.00397	0.00266	0.00044	−0.00345	0.00236	−0.00104	−0.00396	0.00213
	(0.96306)	(0.00000)	(0.00000)	(0.36793)	(0.00000)	(0.00000)	(0.17830)	(0.00000)	(0.00000)
Advertising intensity	−0.00528	−0.01358	0.08793	−0.00548	−0.01435	0.08948	−0.00314	−0.00718	0.13556
	(0.44735)	(0.00234)	(0.00000)	(0.43574)	(0.00140)	(0.00000)	(0.65858)	(0.19085)	(0.00000)
Capital expenditure	−0.00984	−0.01313	0.02265	−0.00990	−0.01318	0.02256	−0.00575	−0.00808	0.02655
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00022)	(0.00000)	(0.00000)
Share repurchase	0.00097	0.00136	0.00396	0.00086	0.00123	0.00395	0.00084	0.00125	0.00480
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Dividends	0.00361	0.00499	0.00613	0.00345	0.00487	0.00611	0.00336	0.00412	0.00554
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Institutional ownership									
Transient				0.01042	0.00827		0.00816	0.00706	
				(0.00000)	(0.00000)		(0.00000)	(0.00000)	
Dedicated				−0.00963	−0.01065		−0.00922	−0.01230	
				(0.00000)	(0.00000)		(0.00000)	(0.00000)	
Quasi-indexer				0.01079	0.00787		0.00351	0.00249	
				(0.00000)	(0.00000)		(0.00194)	(0.00015)	
Unknown category				−0.02309	−0.02519		−0.01627	−0.01287	
				(0.00000)	(0.00000)		(0.00001)	(0.00000)	

TABLE 3 (Continued)

DV = IDR	FE (1)	RCM Beta (2a)	RCM SD (2b)	FE (3)	RCM Beta (4a)	RCM SD (4b)	FE (5)	RCM Beta (6a)	RCM SD (6b)
Financial health									
Financial slack							−0.00135	−0.00384	
							(0.01337)	(0.00000)	
Sales growth							−0.00029	−0.00028	
							(0.00025)	(0.00076)	
Firm age							0.00181	0.00065	
							(0.00000)	(0.00000)	
N (observations)	94,377	94,377		94,377	94,377		71,676	71,676	
N (groups)	10,756	10,756		10,756	10,756		8,210	8,210	
R^2	0.2578			0.2646			0.2952		
Log likelihood		237,137			237,465			187,208	
p-Value (LR test vs. linear regression)		0.0000			0.0000			0.0000	
Chi-square		23,175.63			23,954.49			20,368.21	

Note: p-Values in parentheses. All models include time period fixed effects. *SEs* are clustered at the firm level in the fixed effects models.
Abbreviations: FE, fixed effects models; IDR, implied discount rate; LTIP, long-term incentive plans; RCM, random coefficient models.

TABLE 4 Explaining IDR: Management incentives and external pressure

	FE	RCM		FE	RCM		FE	RCM	
		Beta	*SD*		Beta	*SD*		Beta	*SD*
DV = IDR	**(1)**	**(2a)**	**(2b)**	**(3)**	**(4a)**	**(4b)**	**(5)**	**(6a)**	**(6b)**
Management incentives									
LTIP - CEO	−0.00041	−0.00043					−0.00051	−0.00050	
	(0.04041)	(0.07481)					(0.01842)	(0.03864)	
CEO turnover	0.00457	−0.00141					−0.02463	−0.02366	
	(0.00243)	(0.20074)					(0.00000)	(0.00000)	
External pressure									
Earnings response coefficient				0.00008	0.00005		0.00006	0.00004	
				(0.00156)	(0.00768)		(0.02245)	(0.14500)	
Activism threat				0.00359	0.00306		0.00439	0.00309	
				(0.00000)	(0.00131)		(0.00005)	(0.03581)	
Analyst coverage				0.00026	0.00065		−0.00077	−0.00023	
				(0.10394)	(0.00000)		(0.00620)	(0.10113)	
Firm investment									
R&D intensity	−0.00550	−0.01197	0.00338	−0.00063	−0.00378	0.00000	−0.00463	−0.01435	0.00382
	(0.02042)	(0.00003)	(0.00104)	(0.56384)	(0.00031)	(0.00000)	(0.22114)	(0.00002)	(0.00670)
Advertising intensity	−0.02370	0.01429	0.12054	−0.01933	0.00158	0.13799	−0.02107	0.02989	0.18504
	(0.35186)	(0.20121)	(0.00000)	(0.14055)	(0.85672)	(0.00000)	(0.44432)	(0.06258)	(0.00000)
Capital expenditure	−0.00569	−0.01289	0.01391	−0.00067	−0.00575	0.03583	−0.00367	−0.01293	0.03405
	(0.17411)	(0.00004)	(0.00000)	(0.80830)	(0.01555)	(0.00000)	(0.47479)	(0.00130)	(0.00000)
Share repurchase	0.00058	0.00068	0.00269	0.00077	0.00081	0.00128	0.00057	0.00062	0.00174
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Dividends	0.00226	0.00322	0.00434	0.00227	0.00381	0.00415	0.00180	0.00295	0.00318
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00001)	(0.00000)	(0.00000)

TABLE 4 (Continued)

DV = IDR	FE (1)	RCM Beta (2a)	RCM *SD* (2b)	FE (3)	RCM Beta (4a)	RCM *SD* (4b)	FE (5)	RCM Beta (6a)	RCM *SD* (6b)
Institutional ownership									
Transient	0.00508	0.00703		0.00828	0.00781		0.00755	0.00713	
	(0.00406)	(0.00000)		(0.00000)	(0.00000)		(0.00000)	(0.00000)	
Dedicated	−0.01894	−0.02228		−0.01293	−0.01877		−0.01476	−0.01904	
	(0.00000)	(0.00000)		(0.00000)	(0.00000)		(0.00000)	(0.00000)	
Quasi-indexer	−0.00712	−0.00128		−0.00523	−0.00382		−0.00492	−0.00174	
	(0.00038)	(0.17879)		(0.00001)	(0.00000)		(0.00296)	(0.11407)	
Unknown category	−0.04857	−0.03475		−0.00017	0.01092		−0.04593	−0.03298	
	(0.00000)	(0.00000)		(0.96761)	(0.00116)		(0.00000)	(0.00001)	
Financial health									
Financial slack	−0.00196	−0.00528		−0.00261	−0.00476		−0.00228	−0.00605	
	(0.33695)	(0.00000)		(0.03712)	(0.00000)		(0.35436)	(0.00000)	
Sales growth	−0.00077	−0.00102		−0.00035	−0.00053		−0.00020	−0.00055	
	(0.05710)	(0.00041)		(0.04272)	(0.00146)		(0.72288)	(0.17833)	
Firm age	0.00239	0.00072		0.00252	0.00081		0.00231	0.00083	
	(0.00000)	(0.00000)		(0.00000)	(0.00000)		(0.00000)	(0.00000)	
Intercept	−0.06229	−0.04329	0.00927	−0.06024	−0.04470	0.01259	−0.05431	−0.03772	0.01049
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
N (observations)	11,512	11,512		24,346	24,346		8,901	8,901	
N (groups)	1,566	1,566		3,858	3,858		1,378	1,378	
R^2	0.36377			0.42421			0.37757		
Log likelihood		33,418			69,887			26,281	
p-Value (LR test vs. linear regression)		0.0000			0.0000			0.0000	
Chi-square		5,505.73			12,798.63			4,367.79	

Note: p-Values in parentheses. All models include time period fixed effects. *SEs* are clustered at the firm level in the fixed effects models.
Abbreviations: FE, fixed effects models; IDR, implied discount rate; LTIP, long-term incentive plans; RCM, random coefficient models.

Capital expenditure (p = .000) bears a negative correlation with IDR across specifications, suggesting that firms investing more in capital are discounted less by the market than their peers investing less. However, with the significant *SD* reported in the (b) columns, the magnitude of this effect also depends on the firm.

Firm spending on both *Share repurchase* and *Dividends* is significantly positively correlated with IDR (p-value = .000 for both). We note also the significant *SD* on both of these effects reported by the RCM. These effects are strong and robust across specifications, suggesting that firms that spend on buying back shares or issuing dividends may be doing this in lieu of other investments such as R&D or capital equipment that would generate longer-term returns.[30] That such firms are more heavily discounted by the market, while firms investing more in either intangibles (R&D and/or advertising) or capital are less discounted by the market, are observations consistent with interpreting IDR as a proxy for firm time horizons and suggest how firm behavior reveals heterogeneity in underlying time horizons.

We then add measures of a firm's financial health and maturity in the final three columns of Table 3. *Financial slack*, capturing the ability of firms to invest as well as being a proxy for the financial health and future prospects of a firm, is negatively and significantly correlated with IDR (p = .013 and .000 for the fixed effect model and RCM, respectively). *Sales growth* bears a negative and significant relationship with IDR across specifications (p = .000 for both). Since *Sales growth* is a proxy for future growth expectations, this negative relationship suggests that IDR captures, at least in part, shareholder expectations about future opportunities for the firm. In contrast, *Firm age* is positively correlated with IDR (p = .000 for both). This variable is included as a control for lower growth potential we might expect to see in more mature firms. In such cases, increased IDR may be a rational market response to expectations around diminished future growth.

Measures of a firm's institutional ownership are added in Columns (3) and (4), all of which are statistically significant at conventional levels. The coefficient estimate on *Transient* is as expected; as the percentage of a firm's shares held by transient institutional investors increases, IDR decreases (p = .000 for all specifications). This result is consistent with prior research that shows firms cut investments in order to make earnings targets when they have more transient ownership (i.e., institutional owners with high portfolio turnover (Bushee, 1998)). *Dedicated* institutional ownership has the opposite effect; as ownership by institutions with low portfolio turnover increases, IDR decreases (p-value = .000 for all specifications). One possible interpretation is that, when investors hold stocks for longer period of time in a firm, pressures to sacrifice long-term gains to make short-term earnings targets decrease. This is correlated with a compensating decrease in discounting of the firm's future cash flows.

Institutional ownership by *Quasi-indexers* has a positive relationship with firm IDR (p = .000, all specifications), suggesting that pressure for short-term payoffs increases with rising investment by quasi-indexers. While we did not have specific priors on the effect of *Quasi-indexers*, our result is consistent with Porter (1992), who argues that quasi-indexers increase pressures for short-term investment behavior because these investors have fragmented ownership; this reduces monitoring of firms and managers. We also did not have priors on unclassified institutional investors, *Unknown Category*, which is significantly negatively correlated with

[30]This effect is also consistent with the argument that such returns of cash to shareholders may be due to lack of investment opportunities for the firm. In either case, however, we expect a firm's long-term returns to be discounted more by the market.

short termism ($p = .000$, all specifications).[31] Because the FE model is identified on firms that have changes in the levels of transient or dedicated institutional ownership and to the extent that those changes may be exogenous to the focal firm, estimates on these variables can be thought of as explaining to some extent *why* a firm's IDR changes, not simply an explanation of what changes correlate with firm IDR.[32] Overall, our estimates in Table 3 show that IDR is correlated in largely expected ways with measures that have been previously argued to be indicators of firm time horizons, even controlling for firm heterogeneity on expected future growth. They also reveal how firm behavior explains heterogeneity in time horizons as well as to a more limited extent explain why firm IDR levels change over time (e.g., around increases in transient institutional investor holdings).

Management incentives as well as sources of external pressure (such as analyst coverage) are also thought to be correlated with firm time horizons; we estimate these effects in Table 4. Note that the sample size is significantly reduced in these estimations, since data on several measures is only available for a limited number of firms.

Long-term compensation (LTIP - CEO) has a significantly negative relationship with IDR, as expected (p values range from .018 to .075). In contrast, *CEO turnover* shows mixed effects. Column (1) shows a significant positive relationship with IDR ($p = .002$), consistent with expectations that shorter tenure is indicative of shorter time horizons. However, this effect reverses in the RCM and when we add measures of external pressure in (5) and (6); shorter average tenure (i.e., higher turnover) dampens IDR.[33] For the RCM, the coefficient on *CEO turnover* falls outside of traditional significance levels ($p = .201$), likely due to the firm variance that is picked up by the free investment parameters (i.e., R&D intensity, etc.). Simple explanations for the significant negative relationship in Columns (5) and (6) are elusive, but likely include the change of sampling, since our sample size drops when we add external pressure measures. It is possible that changing CEOs is a strong signal that a firm is making necessary changes to adapt to market conditions and explore new opportunities, for example. This would be consistent with Hambrick and Fukutomi (1991), who argue that CEOs with very long tenure may tend toward shorter time horizons, due to personal considerations such as more imminent retirement. Further exploration is required, however, to draw conclusions on the relationship between CEO turnover and IDR.

The effects of two of the three measures of external pressure behave as expected and largely consistently across specifications. *ERC* and *Activism threat* have significantly positive relationships with IDR ($p = .002$ and .000 in Column (3), respectively),[34] suggesting when a firm's stock prices are more sensitive to earnings news or there is significant shareholder activism in the industry that may affect the firm in future, then the firm plausibly emphasizes short-term returns and future cash flows are more heavily discounted. Results on the fixed effect models specifically suggest that when the activist threat increases in a firm's industry, an effect largely exogenous to firm specific behavior, the firm's time horizons contract, captured via increasing IDR.

The effects of *Analyst coverage* are more challenging to interpret; the coefficients are largely significant but change sign according to the sampling. In the larger sample, *Analyst coverage*

[31]These investors tend to be dedicated investors, but have few holdings and insufficient information to categorize (per discussions with Brian Bushee in March, 2016).

[32]This will also be true for FE models estimating the relationships between IDR and *Activism Threat* and *Analyst Coverage*, as discussed below.

[33]We also introduce a squared term of CEO tenure in unreported models, similar to Hambrick and Fukutomi (1991), but do not find significant curvilinear relationship between tenure and IDR.

[34]The relationship between ERC and IDR is outside conventional significance levels in (6), where $p = .145$.

shows a positive correlation with IDR ($p = .104$ and .000 for the fixed effect model and RCM, respectively), suggesting that greater attention from analysts may lead firms to conform to analyst preferences, which often favor short-term, less risky investments (e.g., Benner, 2010). However, it is not clear what conclusions we can draw from this, since the sign of the coefficient flips when we constrain the sample by adding management incentive measures in Columns (5) and (6). Since the incentive measures are only available for S&P 1500 firms, which tend to be larger, older firms, it is possible that increasing analyst coverage provides greater transparency on entrenched CEOs. This finding appears consistent with Barth et al. (2001), who find a positive correlation between R&D spending and analyst coverage among the larger, publicly listed firms in the first decade of our sample frame (1983–1994). For our purposes here, however, we focus on the overall pattern presented by the variables and leave resolution of this specific puzzle to future exploration.

Note that our coefficient on *Quasi-indexer* becomes negative in the smaller sample represented in Table 4. Compared to the sample in Table 3, firms in Table 4 tend to be older (i.e., median age of 18 years in Table 4, vs. 8 years in Table 3) and have more substantial ownership by quasi-indexer institutional owners (median of 29.5% and 4.2% for Tables 4 and 3, respectively). Splitting the sample according to the median quasi-indexer holdings reveals that the effect of *Quasi-indexer* depends on the level of ownership; those firms with above median holdings by quasi-indexers show a negative relationship between increased institutional ownership and IDR, while those with below median holdings show a positive relationship between *Quasi-indexer* and IDR, irrespective of sample (i.e., in either Tables 3 or 4).[35] Thus, the effect of *Quasi-indexer* institutional ownership appears to depend upon the size of the holdings; IDR is lower for firms that have substantial holdings by *Quasi-indexers*, perhaps due to the low turnover that characterizes such institutional investors. This finding runs counter to the hypothesis put forth by Porter (1992).

In addition to our main analyses reported above, we also conducted extensive robustness checks, summarized and reported in Online Appendix C. We note what we deem the most critical tests here. First, a limitation of our analysis is that we cannot rule out the possibility that IDR is a driver of future firm actions and opportunities as opposed to a response to past firm behavior. While firm-level characteristics are correlated in largely expected directions with future IDR, it is challenging to pin down the direction of causality without an experiment. We argue here that firm behavior affects market perceptions and, thus, later IDR, but it is also possible that investor preferences around time horizons (included in IDR) also affect subsequent firm behavior. Since we focus in this article on the first relationship, that is, IDR as a dependent variable, we examine whether firm behavior and characteristics affect later IDR in a sample where reverse causality is less plausible. Specifically, we estimate Column (1) from Table 3 for 2,280 newly listed firms in their first period since IPO (1980 or later). In a sense, we treat IPOs as imperfect, one-off experimental events and examine how the market evaluates firms with varying initial investment strategies and ownership structures. By focusing on the period immediately after IPO only, we alleviate some concerns that firm behaviors are solely a response to past movement in stock price.

In Table C.1, we include only a single observation per firm that captures investment and institutional ownership in the window immediately after IPO and IDR in the following time period. We exclude remaining variables because these other variables either require more than

[35]These results are available upon request.

one year of data or show little variance for newly listed firms.[36] We find that results are largely consistent with our main analysis; higher levels of R&D, advertising and capital investments in the first period since IPO are associated with lower discounting in the subsequent period, while dividends are associated with higher discounting. We also find that transient and dedicated ownership predicts discounting as expected, though not always within conventional significance levels. These two variables are significant, however, with a high-dimensional fixed effects model that accounts for industry by time effects, with robust standard errors. This model helps to control for the IPO market environment at the time of listing. While R&D intensity is less significantly correlated, the effects of advertising, capital expenditures, and dividends are robust to the inclusion of these industry-time fixed effects. Overall, these results support our conjecture that the market incorporates information from firm behavior and characteristics in its evaluation of time horizons for firm returns.

A related concern is that the firm-level effects shown in Tables 3 and 4 may not be robust to inclusion of relevant industry-level factors. To control for industry factors, we again construct a high-dimensional fixed-effects model with fixed industry by period effects, which capture any environmental influence specific to an industry at a given time, in addition to firm fixed effects for our full sample. The cost of employing such models is that we lose statistical power as well as the flexibility to model heterogeneous market responses, since any effect estimated cannot vary across firms. Nevertheless, in Table C.2, we observe results consistent with those already reported in the fixed effects models above with some exceptions. As reported in the fixed effects models in Tables 3 and 4 above, we observe null R&D and advertising effects here, likely due to our inability to estimate firm level heterogeneity in these models.

Overall, these results as a whole show that IDR reflects firm investment behavior, financial position, institutional ownership as well as other external market pressures and executive compensation in largely expected ways. Since these variables, suggested by earlier research, are thought to be correlated with short or long-term firm behavior, the results provide corroboration that IDR captures market expectations of firm time horizons. Thus, we argue that IDR reflects investor perceptions of past firm behavior related to the timing of returns.

5 | DISCUSSION AND CONCLUSION

In this article, we introduce a measure, IDR or a firm's implied discount rate, which is drawn from asset pricing theory, and then use this measure to explore whether firms have become more short-term oriented over the past thirty years. Put differently, we use market observations of firm behavior and the expectations that follow, which are incorporated into stock prices and, consequently, our measure, to capture whether firms are becoming more short-term oriented. Our results here suggest they are.

Despite fluctuations, we observe an unequivocal increase in discounting of expected future firm cash flows across the market between 1980 and 2013. Alternative measures of IDR confirm this trend, including one based on analyst earnings forecasts. Further, we show that IDR within firms has increased over time for the majority of firms in our sample, though we also expose significant between-firm heterogeneity. Interfirm heterogeneity in IDR is tied to firm investment strategy and variables that capture exposure to external market pressures, such as analyst coverage and the threat of shareholder activism in an industry. Being previously used as proxies for

[36]This includes share repurchases, which are very rare for newly listed firms.

firm time horizons, we use these variables to evaluate whether our measure, IDR, captures a firm's time orientation.

Further, our analysis allows us to identify how IDR varies across firms within the same time period. Fixed effect models also allow us to examine why IDR changes within a firm over time to a more limited extent; changes in external pressures that are largely exogenous to firm behavior, such as shareholder activism in an industry and analyst coverage, are suggestive of a causal relationship between changes in these external pressures and shifting firm time horizons. These relationships imply that investor and analyst behavior may pressure firms to demonstrate earnings in the near term, influencing firm strategy choices. Because we cannot definitively rule out selection effects in our analysis here, we focus on confirming that firm time horizons are correlated as expected with many markers of external pressures. This suggests that investors may select firms that match a preferred time horizon, rather than exerting influence over firm time horizons. However, earlier research also illustrates that shortening investor time horizons pressure firms to focus more on short-term returns. An examination of how investors may change firm investment behavior and how investors levy this pressure is an important follow on from this work. Such work would not only help guide firms in their internal decisions (particularly around investment strategies), but also guide their communications with external investors and other stakeholders. More effective external communications may help attract capital that shares a firm's optimal or preferred time horizon.

Our results can be explained in part by increasing economic uncertainty facing firms that exacerbates myopic loss aversion. They may also be explained by the inability to arbitrage away mispricing around risky investments, due to lack of definitive information on the source of the mispricing. Such a behavioral mispricing would lead to a preference for short over long-term investment payoffs, as suggested by the strong correlations we observe between IDR and firm specific characteristics that proxy for time horizons. Alternatively, rising IDR may capture unmeasured risk that may be rising over the past 30 years. We have, however, ruled out that most indicators of risk, such as market volatility, implied equity risk premium or any time variant risk that correlates with a firm's industry, explain our results. From this, we conclude that there may well be unidentified risk factors that affect IDR, but that these factors appear to both affect the market broadly and correlate with firm proxies for time horizons.

These findings must be taken with important caveats; much work remains to be done. Our measure, IDR, has limitations; not all agree that asset-pricing models precisely predict asset values and, thus, in our case, discount rates. For these reasons, despite the correlations we observe with alternative discount models estimated, we do not make inferences about the meaning of isolated values of IDR. Accordingly, care must be taken with placing too much weight upon single firm estimates or outside a comparison with other firms in the same time frame. While the imperfections of our measure challenge interpretation of single values, they do not prevent inference from the time trend or the relative differences in the discounting measure between firms in the cross section and correlations with established signals of firm time horizons.

The above discussion implies that we cannot determine what is an optimal discount rate on average across the market or for a specific firm. Such a determination is required to better understand whether a short-term orientation is helpful or harmful to specific firms.[37] This is

[37]In some cases, short-term pressures likely cause the firm to deviate from optimal strategy, while in others such actions may be desirable. For example, younger firms that need to attract more capital may emphasize short-term results optimally (e.g., Baker, 2000; Gompers, 1996).

challenging, given the inability to observe a firm's investment opportunities. However, with a more complete understanding of sources of firm and market systematic risk, as well as firm specific cost of capital, it may be possible to analyze whether an increase in IDR improves or hinders long-term firm performance. Observing firm investments relative to subindustry technology development cycles in conjunction with firm strategy (e.g., whether the firm is an industry leader or fast follower) may also offer some clues as to whether short-term perspectives are suboptimally altering a firm's investment portfolio and, consequently, expected future growth. We leave the challenge of identifying how firm discount rates *should* vary according to firm potential and past track record as well as vary over time to future research.

The implications of our results are far reaching. Our IDR measure provides a mechanism for evaluating whether firm time horizons have shifted and our results above point to contracting time horizons on average, with clear heterogeneity between firms. This heterogeneity helps explain the apparent inconsistency between the existence of firms with a long-time horizon (e.g., firms willing to make risky, long-term bets such as Apple or Google) and the market-wide trend of increased short termism by firms noted in the press and this empirical work.

If firms on average are becoming more short-term oriented, they will seek investment opportunities that yield short-term returns. This is of little consequence if those types of investments are the best opportunities for the firm when evaluated not only on timing of payoffs but also in conjunction with the need to ensure long-term growth and survival. Firms, however, may not pursue profitable strategies if payoffs are less transparent (e.g., R&D investment) or spread over a longer term. It is difficult to underestimate what this implies for longer-term firm productivity. If firms change their strategy to favor short-term payoffs, long-term firm growth and performance may suffer. While we cannot currently identify for which firms shortening time horizons are most problematic, since we do not observe alternative strategies available to the firm, it is likely that increasing impatience is not ideal for at least some publicly listed firms, even if it may be a rational response to increased economic uncertainty.

The implications of our analysis extend beyond firm performance, however, to the economy as a whole. The potentially changing nature of R&D investment is one illustration. If firms are changing their R&D strategies and abandoning projects that may yield long-term and more significant payoffs, then contracting time horizons could profoundly affect long-term productivity and economic growth. While it is possible that private firms and start-ups will take up profitable investment opportunities left behind by publicly listed firms, it is difficult for private equity held firms or VC funded startups to take on certain large-scale projects with steep capital requirements, such as aircraft or materials science. As such, whether and how changing time horizons are affecting both the level and nature of firm investment, particularly in R&D, is a vital area for future research.

Ultimately, this article represents a market-wide assessment of the change in how markets discount firms over time as well as analysis and discussion of what these observed trends imply for firm time horizons and strategy. While our work sheds light on an important phenomenon for firms, markets, and policy makers, these results raise as many questions as they answer. Our objective is to start a more specific dialogue that focuses on how firm time horizons are shifting and the heterogeneous implications for firm strategy.

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ORCID

Rachelle C. Sampson https://orcid.org/0000-0002-2113-7802
Yuan Shi https://orcid.org/0000-0003-2675-986X

REFERENCES

Abarbanell, J., & Bernard, V. (2000). Is the US stock market myopic? *Journal of Accounting Research*, *38*(2), 221–242.

Aggarwal, R. (2008). Executive compensation and incentives. In B. E. Eckbo (Ed.), *Handbook of empirical corporate finance* (Vol. 2, pp. 497–538). Amsterdam, Netherlands: Elsevier.

Aghion, P., Van Reenen, J., & Zingales, L. (2013). Innovation and institutional ownership. *American Economic Review*, *103*(1), 277–304.

Alcácer, J., Chung, W., Hawk, A., & Pacheco-de-Almeida, G. (2018). Applying random coefficient models to strategy research: Identifying and exploring firm heterogeneous effects. *Strategy Science*, *3*(3), 533–553.

Almeida, H., Fos, V., & Kronlund, M. (2016). The real effects of share repurchases. *Journal of Financial Economics*, *119*(1), 168–185.

Asker, J., Farre-Mensa, J., & Ljungqvist, A. (2015). Corporate investment and stock market listing: A puzzle? *Review of Financial Studies*, *28*(2), 342–390.

Baker, M. (2000). *Career concerns and staged investment: Evidence from the venture capital industry*. (Working Paper).

Ball, R., & Brown, P. (1968). An empirical evaluation of accounting income numbers. *Journal of Accounting Research*, *6*(Suppl 2), 159–178.

Barth, M. E., Kasznik, R., & McNichols, M. F. (2001). Analyst coverage and intangible assets. *Journal of Accounting Research*, *39*(1), 1–34.

Benartzi, S., & Thaler, R. H. (1995). Myopic loss aversion and the equity premium puzzle. *Quarterly Journal of Economics*, *110*(1), 73–92.

Benartzi, S., & Thaler, R. H. (1999). Risk aversion or myopia? Choices in repeated gambles and retirement investments. *Management Science*, *45*(3), 364–381.

Benner, M. J. (2010). Securities analysts and incumbent response to radical technological change: Evidence from digital photography and internet telephony. *Organization Science*, *21*(1), 42–62.

Bettis, J. C., Bizjak, J., Coles, J. L., & Kalpathy, S. (2018). Performance-vesting provisions in executive compensation. *Journal of Accounting and Economics*, *66*(1), 194–221.

Bratton, W. (2010). *Hedge funds and governance targets: Long-term results*. University of Pennsylvania Institute for Law and Economics (Working Paper No. 10-17).

Brav, A., Jiang, W., & Kim, H. (2015). *The real effects of hedge fund activism: Productivity, asset allocation and labor outcomes*. (NBER Working Paper No. 17517).

Brav, A., Jiang, W., Partnoy, F., & Thomas, R. (2008). Hedge fund activism, corporate governance and firm performance. *Journal of Finance*, *63*(4), 1729–1775.

Brochet, F., Loumioti, M., & Seraphim, G. (2014). *Short-termism, investor clientele and corporate performance*. (HBS Working Paper No. 12-072).

Bushee, B. J. (1998). The influence of institutional investors on myopic R&D investment behavior. *Accounting Review*, *73*(3), 305–333.

Bushee, B. J. (2001). Do institutional investors prefer near-term earnings over long-run value? *Contemporary Accounting Research*, *18*(2), 207–246.

Chung, W., & Alcácer, J. (2002). Knowledge seeking and location choice of foreign direct investment in the United States. *Management Science*, *48*(12), 1534–1554.

Davies, R., Haldane, A. G., Nielsen, M., & Pezzini, S. (2014). Measuring the costs of short-termism. *Journal of Financial Stability*, *12*, 16–25.

deHaan, E., Larcker, D., & McClure, C. (2019). Long-term economic consequences of hedge fund activist interventions. *Review of Accounting Studies*, *24*(2), 536–569.

DesJardine, M. R. (2015). Under pressure: The causal effect of financial analyst coverage on long-term capital. In *Academy of management proceedings* (Vol. 2015, 15031). Briarcliff Manor, NY: Academy of Management.

Easton, P. (2007). Estimating the cost of capital implied by market prices and accounting data. *Foundations and Trends in Accounting*, *2*(4), 241–364.

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

Fama, E. F., & French, K. R. (2008). Dissecting anomalies. *Journal of Finance*, *63*(4), 1653–1678.

Fellner, G., & Sutter, M. (2009). Causes, consequences, and cures of myopic loss aversion–an experimental investigation. *Economic Journal*, *119*(537), 900–916.

Financial Industry Regulatory Agency. (2016). UPC General FAQ. Retrieved from https://www.finra.org/industry/faq-upc-general-faq

Flammer, C., & Bansal, P. (2017). Does a long-term orientation create value? Evidence from a regression discontinuity. *Strategic Management Journal*, *38*(9), 1827–1847.

Fos, V. (2017). The disciplinary effects of proxy contests. *Management Science*, *63*(3), 655–671.

Gebhardt, W. R., Lee, C. M., & Swaminathan, B. (2001). Toward an implied cost of capital. *Journal of Accounting Research*, *39*(1), 135–176.

Gneezy, U., Kapteyn, A., & Potters, J. (2003). Evaluation periods and asset prices in a market experiment. *Journal of Finance*, *58*(2), 821–837.

Gneezy, U., & Potters, J. (1997). An experiment on risk taking and evaluation periods. *Quarterly Journal of Economics*, *112*(2), 631–645.

Gompers, P. A. (1996). Grandstanding in the venture capital industry. *Journal of Financial Economics*, *42*(1), 133–156.

Graham, J. R., Harvey, C. R., & Rajgopal, S. (2005). The economic implications of corporate financial reporting. *Journal of Accounting and Economics*, *40*(1–3), 3–73.

Greenwood, R., & Schor, M. (2009). Investor activism and takeovers. *Journal of Financial Economics*, *92*(3), 362–375.

Haigh, M. S., & List, J. A. (2005). Do professional traders exhibit myopic loss aversion? An experimental analysis. *Journal of Finance*, *60*(1), 523–534.

Hambrick, D. C., & Fukutomi, G. D. (1991). The seasons of a CEO's tenure. *Academy of Management Review*, *16*(4), 719–742.

Hsieh, P., Koller, T., & Rajan, S. (2006). The misguided practice of earnings guidance. McKinsey on Finance, Spring 2006. Retrieved from http://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-misguided-practice-of-earnings-guidance

Kaplan, S. (2017). *Are U.S. companies too short-term oriented? Some thoughts*. (Working Paper).

Kaplan, S. N., & Minton, B. A. (2012). How has CEO turnover changed? *International Review of Finance*, *12*(1), 57–87.

Knott, A. M. (2008). R&D/returns causality: Absorptive capacity or organizational IQ. *Management Science*, *54*(12), 2054–2067.

Knott, A. M. (2019). *The record on R&D outsourcing. Center for Economic Studies*. (Working Paper No. 16-19). Retrieved from: https://ssrn.com/abstract=2756220.

Knott, A. M. & Vieregger, C. (2019). *Does R&D drive growth*. (SSRN Working paper). Retrieved from: https://ssrn.com/abstract=2382885.

Kothari, S. P. (2001). Capital markets research in accounting. *Journal of Accounting and Economics*, *31*(1–3), 105–231.

Larcker, D. F. (1983). The association between performance plan adoption and corporate capital investment. *Journal of Accounting and Economics*, *5*, 3–30.

Laverty, K. J. (1996). Economic "short-termism": The debate, the unresolved issues, and the implications for management practice and research. *Academy of Management Review*, *21*(3), 825–860.
Loewenstein, G., & Thaler, R. H. (1989). Anomalies: Intertemporal choice. *Journal of Economic Perspectives*, *3*(4), 181–193.
Mankins, M., Harris, K., & Harding, D. (2017). *Strategy in the age of superabundant capital*. Boston, MA: Harvard Business Review. https://hbr.org/2017/03/strategy-in-the-age-of-superabundant-capital
Manufacturers Alliance for Productivity and Innovation (2016) Lowering the bar: Hurdle rates. Retrieved from https://www.mapi.net/blog/2016/04/lowering-bar-hurdle-rates
Meier, I. & Tarhan, V. (2007). *Corporate investment decision practices and the hurdle rate premium puzzle*. (SSRN Working Paper). Retrieved from https://doi.org/10.2139/ssrn.960161
Miles, D. (1993). Testing for short termism in the UK stock market. *Economic Journal*, *103*(421), 1379–1396.
Mizik, N. (2010). The theory and practice of myopic management. *Journal of Marketing Research*, *47*(4), 594–611.
National Science Foundation, National Center for Science and Engineering Statistics. (2016). National patterns of R&D resources. Retrieved from https://www.nsf.gov/statistics/2016/nsb20161/#/data
Norli, Ø., Ostergaard, C., & Schindele, I. (2015). Liquidity and shareholder activism. *Review of Financial Studies*, *28*(2), 486–520.
Porter, M. E. (1992). Capital disadvantage: America's failing capital investment system. *Harvard Business Review*, *70*(5), 65–82.
Poterba, J. M., & Summers, L. H. (1995). A CEO survey of US companies' time horizons and hurdle rates. *MIT Sloan Management Review*, *37*(1), 43.
Qi, J. (2015). *The threat of shareholder intervention and firm innovation*. (Working Paper).
Scholes, M., & Williams, J. (1977). Estimating betas from nonsynchronous data. *Journal of Financial Economics*, *5*(3), 309–327.
Shleifer, A., & Vishny, R. W. (1997). The limits of arbitrage. *Journal of Finance*, *52*(1), 35–55.
Souder, D., & Shaver, J. M. (2010). Constraints and incentives for making long horizon corporate investments. *Strategic Management Journal*, *31*(12), 1316–1336.
Thaler, R. H., Tversky, A., Kahneman, D., & Schwartz, A. (1997). The effect of myopia and loss aversion on risk taking: An experimental test. *Quarterly Journal of Economics*, *112*(2), 647–661.
The Economist. The Sound of Silence. (2006). The economist, 27 April.
Vasella, D., & Leaf, C. (2002). "Temptation is all around us" Daniel Vasella of Novartis talks about making the numbers, self-deception, and the danger of craving success. Fortune.
Zhang, Y., & Gimeno, J. (2016). Earnings pressure and long-term corporate governance: Can long-term-oriented investors and managers reduce the quarterly earnings obsession? *Organization Science*, *27*(2), 354–372.

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